GENERAL LIBRARY,
UNIV. OF MICH.
NOV 17 1904

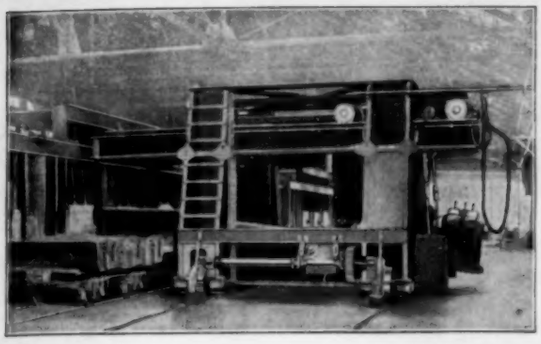
THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

VOLUME XXXVII — CLEVELAND, OHIO, NOVEMBER 17, 1904 — NUMBER 46

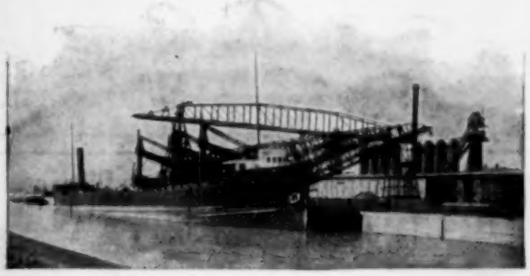
THE WELLMAN-SEAVER-MORGAN CO.

WELLMAN-SEAVER-MORGAN ENGINEERING DIVISION — ENGINEERS AND MANUFACTURERS — WEBSTER, CAMP & LANE DIVISION



Wellman High Type Charging Machine, Cars and Boxes, at Grand Crossing Tack Co.'s Open Hearth Plant, Hutchinson, Ill.

Works designed for The Buffalo Foundry Co. (Night scene.)



Hulett Patent Vessel Unloaders, at Lackawanna Steel Co.'s Plant, Buffalo, N. Y.

COMPLETE IRON AND STEEL PLANTS DESIGNED and EQUIPPED

Ore and Coal Handling Machinery; Cranes; Power Machinery—Steam, Gas or Water; Mining Machinery; Coke Oven Machinery; Reversing Valves; Steel Castings, etc., etc.

Write for Booklet, "WHAT WE DO"

Showing five 20-ton Gantry Cranes, at Lackawanna Steel Co., Buffalo, N. Y. Ten of these cranes furnished.

Hulett Patent Excavating Buckets. An order of twelve for The M. A. Hanna Co.'s Ashtabula Docks.

GENERAL OFFICES, CLEVELAND, OHIO

NEW YORK OFFICE, 42 Broadway
PITTSBURG OFFICE, Frick Building
CHICAGO OFFICE, First Nat'l Bank Bldg.

WORKS, CLEVELAND AND AKRON

CHICAGO DROP FORGE & FDRY. CO.

WORKS ESTABLISHED 1880

DROP FORGINGS

OF ALL KINDS

KENSINGTON, ILLS.

☞ 38 minutes South of Chicago by Ills. Central R. R. Suburban trains.

Fire Brick, Fire Clay, Pig Iron. F. B. STEVENS, Detroit, Mich.

Steel and Malleable Castings

True to pattern. Quality unsurpassed. Steel will harden like tool steel.

Acme Steel & Malleable Iron Works
BUFFALO, N. Y.

TURNBUCKLES

CLEVIS NUTS

CLEVELAND CITY FORGE & IRON CO.
CLEVELAND, OHIO.

MEADVILLE MALLEABLE IRON CO.,
MEADVILLE, PA.
MALLEABLE CASTINGS of any description.
SATISFACTION GUARANTEED.

F. A. EMMERTON,
Chemist, Assayer and Metallurgist.
Ores sampled at lake ports, mines and furnaces. Mines and Metallurgical Processes Examined. Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

AIR COMPRESSORS CATALOGUE GRATIS
AMERICAN AIR COMPRESSOR WORKS
NO. 28 CORTLANDT ST., NEW YORK

The Canton Malleable Iron Co.

MALLEABLE CASTINGS OF ALL KINDS.

CANTON, OHIO.

DROP FORGINGS

Oil Burners, Forges and Crucible Furnaces for Crude Oil Equipment.

Railway Braces, Railway Track Tools, Forged Steel Picks,

Track Wrenches, Steam Hammer Forgings.

Union Drop Forge Co., 68-70 E. Ohio St., CHICAGO, ILL.

Complicated machinery requires constant and expert attendance **SIMPLICITY** is an important feature of

INGERSOLL-SERGEANT MACHINERY

AIR COMPRESSORS PNEUMATIC TOOLS ROCK DRILLS

THE **INGERSOLL-SERGEANT** DRILL CO.

Cleveland, O.
Chicago, Ill.
St. Louis, Mo. J 7

26 CORTLANDT STREET
NEW YORK

Boston, Mass.
Pittsburg, Pa.
Philadelphia, Pa.

IMPERIAL

Riveters
and
Chippers
and
Air Hoists.

NEW CIRCULAR NO. 14
JUST OUT.

IMPERIAL

Piston Drills
and
Wood Borers.

RAND DRILL CO.
128 Broadway
New York.

Write for Prices.

THE IRON TRADE REVIEW

VOLUME XXXVII CLEVELAND, OHIO, NOVEMBER 17, 1904 NUMBER 46

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Heavy anticipatory buying in certain steel products has been the feature of the past week, and accompanying this movement has been a further advance in pig iron. The familiar history of a simultaneous effort to cover, by a large number of buyers in a variety of lines, has been repeated since the election. As a rule, there is no corresponding volume of specifications coming forward, indicating an immediate increase in activity in consuming lines since Nov. 8, but current demand and current mill shipments are by no means insignificant, and they are growing.

The announcement of manufacturers' meetings in New York this week to act on prices of steel billets, bars, plates and shapes proved a wonderful stimulus to inquiry. The efforts of buyers to cover for the first six months of next year, and the persistent unwillingness of steel manufacturers to accept contracts ahead on some products and the advancing of prices for forward deliveries on others, show a reversal of the whole situation in a few weeks. Doubts as to the finished material market following the lead of pig iron are now largely dissipated.

At the New York meeting Tuesday, the billet pool fixed the price of billets at $21, Pittsburg, an advance of $1.50.

Billet inquiry has been heavy and a number of contracts have been closed at $1 to $1.50 above the $19.50 Pittsburg basis. In some cases manufacturers have refused to sell beyond January; in others sales have been made with the stipulation that the buyer pay the pool price at time of delivery. Of finished products steel bars have shown the greatest activity in the past week and in the Central West and the Chicago district it is probable that contracts running well up toward 100,000 tons have been closed, deliveries in many cases running to July 1, 1905. Other heavy bookings were in plates, of which nearly 100,000 tons were taken in the Chicago district, largely for steel car account. Contracts for 10,000 to 15,000 cars, steel and wood, are about to be placed, and it is estimated that the leading roads of the country will contract in the next few months for 75,000 freight cars, of which 55,000 will be steel. While specifications for plate mills are not all that could be wished at the moment, the prospect is exceedingly bright.

In rails, as well as equipment, the railroad demand already indicated will be large for the coming year and the adjustment of the question of tonnage with the Buffalo mill is believed to be the only hindrance to the naming of prices and the booking of important business for 1905. Axles and spikes have both been important features of the demand in the past week.

Inquiry for wire products is heavy and jobbers are seeking to buy for early months next year, but producers expect to make an early advance in prices and refuse to sell beyond December on present basis.

It is early for building projects to come out, but the election result has quickened expectations of a new construction movement, taking in electric lines as well as buildings and bridges. In all these the financial factor is important, and it is yet early for developments of that character.

The pig iron market, with an apparent abatement of the feverishness of a fortnight ago, has made further advances. Some round lots of iron have been taken at the new figures and $13 Birmingham, for No. 2 Southern has been well established, with $13.50 quoted by important interests. A sale of 12,000 tons of Bessemer pig at $14 Valley furnace was made for delivery this year. The current quotation is $14.50 and Northern foundry iron furnaces have sold No. 2 at $14.50 and $15, while $16 Chicago is the basis since the recent advance. The feeling that the advance has been rapid and should not go farther is growing. In the East the question of imports has been raised, and a number of consumers have been asked to consider propositions for foreign iron. Middlesboro No. 3 is quoted $10.75 at furnace. The duty is $4. The variable factor of ocean freights makes up the balance of a price now not far from the asking price of some domestic producers for delivery at the Eastern seaboard.

Coke supply is now and will be the key to the pig iron situation. In the Connellsville region, a heavy rainfall is needed to permit of increased output.

Belated buying of Lake Superior ores is of considerable proportions. It now seems likely that ore shipments will be nearer twenty-one million than twenty million tons, a total far above any early estimate.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Nov. 16.

The pig iron market continues to make new records, further advances of 50 cents to $1 a ton having been recorded during the week. Prompt iron for delivery the remainder of the year is exceedingly scarce. Since the beginning of this upward movement in iron the trade generally has experienced much difficulty in diagnosing the situation properly. Many believed that the bulge was due to fourth quarter buying coupled with abnormal conditions as to raw material supply which favored the furnace operator and enabled him to secure higher prices. They were further of the opinion that lower prices would prevail during November and December and looked for the improvement in the iron and steel trade to set in after the first of the year. The developments of the week show a general broadening of demand and the indications are that if lower prices should be made anywhere in the market before the first of the year they will be only temporary.

Railroad buying promises to be unusually heavy. In addition to the 30,000 cars which were contracted for during the past two months, it is estimated that orders will be placed in the near future by the leading roads of the country for 75,000 freight cars, of which 55,000 will be steel. One leading trunk line is having specifications prepared for 20,000 cars, 19,000 to replace missing numbers, so that the remaining thousand will be the only addition to the equipment. To build the steel cars at least 500,000 tons of plates will be required, and despite the increased

plate producing capacity the outlook was never brighter for the plate mills, though with some of them specifications might be better. Fair shipments on the steel car orders recently placed are now being made, however. The recent advances in merchant pipe have resulted in the placing of heavy orders by jobbers throughout the country, and while the first advance was only made a month ago, further orders have been received from these jobbers to replenish stocks, which indicates that the material is going into consumption. Repairs to locomotives by railroads throughout the country have also resulted in heavy buying of boiler tubing, the demand far exceeding that of any other period this year. As the result of this increased business the pipe mills are covering future requirements of skelp, contracts for fully 10,000 tons having been closed during the week, and prices have advanced fully $1 a ton. The demand for both iron and steel bars is also improving, iron bars having advanced $1 during the week, while an advance in steel bars is looked for after the action of the billet pool which met in New York is known.

Whether advances will be made in plates and structural material at the pool meetings in New York this week largely depends upon the action of the billet pool. If a considerable increase in billet prices is made there is a possibility of restoring plates and structural shapes to their former basis. The action of the billet pool is awaited with interest by a large number of independent finishing mills anxious to cover their requirements for the first half of next year. None of the steel producers have been willing to quote a price for delivery after January, and as a result the independent finishing mills have been unable to quote on business offered them for this delivery.

The coke situation continues to interfere with the proper operation of the blast furnaces throughout this district. The water in the reservoirs of the leading coke operators is now down to a lower level than in years, the supply on hand only being sufficient to insure operations for a week or ten days. Unless there is a heavy rain in the meantime, a large number of ovens will be compelled to go out and blast furnaces throughout this entire district will be compelled to bank. Furnace coke for prompt shipment is exceedingly scarce and the quality is not enhanced by the use of sulphur water now used at some of the operations. Further advances in coke prices have also been made, one contract for furnace coke for the first half of next year having been closed at $2.10, while foundry coke on contracts for this period is selling at $2.25 to $2.50.

The buying of pig iron has not been heavy, the largest order calling for 12,000 tons of Bessemer iron for December delivery at $14 at the furnace.

Pig Iron.—Further advances in pig iron have been recorded during the week, and with practically all the available iron in this district and the South sold up for the balance of the year, still further advances are anticipated. We note the sale of 12,000 tons of Bessemer iron for December delivery at $14 at the furnace and sales of small lots of Bessemer have been made since the closing of this deal at $14.50 and $15, furnace. No. 2 foundry iron has advanced to $15.85 Pittsburg, and one sale of a special brand of iron was made at $16.25, Pittsburg. On forge iron $14.85 Pittsburg is quoted, and little is to be had at this price. Southern iron is held at $13.50 Birmingham, although it is possible to do $13. As a result of the shortage of water in the Connellsville region, much high sulphur coke is being produced and the output of good iron at all the furnaces is greatly curtailed. A continuation of this condition in the coke regions will result in the banking of a number of stacks, which will still further advance prevailing iron prices. The Republic Iron & Steel Co. has succeeded in getting sufficient coke to blow in its Hall furnace at Sharon and now has all its Valley stacks in operation, the Atlantic stack at Newcastle having come in last week. The demands of the steel plant are so heavy at present, however, that much iron must be secured from outside furnaces to keep the converters in operation. We revise quotations as follows:

Bessemer, Valley	$14 50 to 15 00
Bessemer, Pittsburg	15 35 to 15 85
No. 1 Foundry	16 25 to 16 50
No. 2 Foundry	15 85 to 16 00
Gray Forge, Pittsburg	14 50 to 14 85
Basic, Valley	14 50 to 14 75
Basic, Pittsburg	15 35 to 15 60

Steel.—Practically all of the steel producers withdrew quotations on billets and sheet bars in the past few days, refusing to accept business until after the action of the New York meeting becomes known. Independent finishing mills are exceedingly anxious to cover for the first half of next year and will no doubt buy heavily provided the action of the association is conservative.

Ferro-Manganese.—We quote domestic ferro at $41 to $41.50 in carload lots and over, delivered at buyer's mill at any point east of the Mississippi.

Muck Bar.—While there is little buying of muck iron, mills are advancing their nominal quotations owing to the higher prices that are prevailing for forge iron. We quote prime muck iron at $27.35 Pittsburg.

Skelp.—The buying of skelp for future delivery has been heavy during the week, contracts for fully 10,000 tons of iron and steel being closed. The market has advanced fully $1 a ton and still further advances are anticipated. We quote grooved steel skelp at 1.45c and sheared at 1.50c. Grooved iron is held at 1.55c and sheared at 1.60c.

Rails and Track Material.—It is probable that a meeting of the rail association will be held at an early date to establish prices for next year. It is reported that the Lackawanna Steel Co. desires a larger allotment and threatens to withdraw unless this is granted. Efforts are being made to adjust this matter. We make the following quotations: Standard sections, 50 lb. and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 12 lb., $22.50; 16 to 20 lb., $21 to $21.50; 25 to 45 lb., $26. Spikes, 1.55c to 1.60c.

Plates.—Good shipments on plate orders received from lake shipbuilding interests have been made by the local mills and specifications are now being received from steel car plants on the orders for cars recently placed. The car requirements of the railroads for 1905 are now estimated at 75,000, of which 55,000 will be steel. A meeting of the plate association will be held in New York this week and the action on prices depends upon the action of the billet association. We quote: Tank plates, ¼ in. thick, 6¼ to 24 in., inclusive, 1.30c f. o. b. mill, Pittsburg; over 24 in. up to 100 in., 1.40c. Extras are as follows per pound: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 in. up to 110 in. in width, not less than 5c per 100 lbs. extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates, 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except the Pacific Coast.

Structural Material.—A meeting of the beam pool will be held in New York following the meeting of the billet manufacturers this week. Some of the manufacturers are in favor of advancing prices and placing them on the basis they were on prior to the recent reduction. We make the following quotations: Beams and channels up to 15 in., 1.40c; over 15 in., 1.50c; angles, 3 x 2 up to 6 x 6, 1.40c; zees, 1.40c; tees, 1.45c; angles, from 3 to 16 in., 1.40c; universal and sheared

plates, 6¼ to 24 in., inclusive, 1.30c; over 24 in., 1.40c base.

Bars.—Demand for iron and steel bars is improving, agricultural implement manufacturers now specifying to replenish their stocks. Iron bars have been advanced to 1.40c and 1.45c Pittsburg, and if further advances are made in forge iron still higher prices are anticipated. We make the following quotations: Bar iron, 1.40c to 1.45c Pittsburg; hoops, 1.55c, and bands, 1.30c, both taking bar extras. Bessemer steel bars, 1.30c; open-hearth steel bars, 1.35c; plow and cultivator beams, 1.30c, net; channels, angles, zees and tees, under 3 in., 1.40c. The following differentials are maintained on steel: Less than 2,000 lb. of a size and not less than 1,000 lb. 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Sheets.—The demand for all grades of sheets continues heavy and considerable business for delivery next year continues to be placed at advances of $2 to $3 a ton over prevailing prices. We make the following quotations on sheets in 500-bundle lots and over: Black, No. 8, 1.60c; No. 9, 1.65c; Nos. 12 to 14, 1.70c; Nos. 15-17, 1.75c to 1.80c; Nos. 18-21, 1.85c to 1.90c; Nos. 22-24, 1.95c; Nos. 25-26, 2c; No. 27, 2.05c; No. 28, 2.10c to 2.15c; No. 29, 2.35c to 2.40c; No. 30, 2.50c to 2.55c. Galvanized: Nos. 12-17, 2.20c to 2.25c; Nos. 18-21, 2.35c to 2.40c; Nos. 22-24, 2.50c to 2.55c; Nos. 25-26, 2.65c to 2.70c; No. 27, 2.90c; No. 28, 3.10c; No. 29, 3.45c to 3.50c; No. 30, 3.85c to 3.90c.

Pipes and Tubes.—Demand during the past month has been very heavy, jobbers replenishing their stocks, and since the first advance many jobbers have placed additional orders, indicating that the material is rapidly going into consumption. No orders for pipe for delivery after the first of the year are now being accepted by most of the mills as they believe that higher prices will prevail. The demand for boiler tubing has also improved, the railroads buying heavily. Discounts to consumers, carload lots, f. o. b. Pittsburg, plus freight to destination according to Tube Rate Book, are as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	69	53	67	51
⅜ to 6 inches	77	67	75½	65½
⅜ and ½ inch	73	61	71	59
7 to 12 inches	72	57	70½	55
Extra Strong Plain Ends.				
⅛ to ⅜ inch	62	50	60	48
½ to 4 inches	69	57	67	55
4½ to 8 inches	65	53	63	51
Double extra strong plain ends, ½ to 8 inches	58	47	56	45

MERCHANT BOILER TUBES, LESS CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1½ inches	46	43
1¾ to 2¼ inches	58	43
2½ inches	60	48
2¾ to 5 inches	66	55
6 to 13 inches	58	43

Wire and Wire Nails.—The trade is expecting an advance in wire products daily. Jobbers throughout the country have been laying in heavy stocks, as prevailing prices were made on material for delivery to the first of December only. We make the following quotations: Wire nails, jobbers' carload lots, $1.60; retailers' carloads, $1.65, and less than carloads, $1.75; painted barb wire, $1.75 to jobbers in carloads; retailers' carloads, $1.80, and less than carloads, $1.90, with 30 cents for galvanizing. Annealed smooth fence wire is held at $1.45, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron and steel cut nails are held at $1.65 to $1.70.

Merchant Steel.—Demand for all grades of merchant steel is improving, agricultural implement manufacturers being the heaviest buyers. Demand for shafting continues light. We make the following quotations: Toe calk, 1.90c; carriage spring steel, 1.75c; tire steel, 1.50c to 1.55c; plow steel, 6 in. and under, 1.35c for Bessemer and open-hearth; plow slabs, ¼ in. and heavier, 1.60c. Drawn and cold rolled shafting is held at 52 percent off in carload lots and 47 off in less than carload lots.

Old Material.—The old material market continues to advance in sympathy with pig iron, and while the buying is limited, dealers and railroads are demanding higher prices than prevailed a week ago. We revise quotations, gross tons, as follows: Heavy melting stock, $14.75 to $15.25; cast scrap, $13.50 to $13.75; No. 1 wrought scrap, $15.25 to $15.50; iron borings, $8.50 to $9; re-rolling rails, $15 to $15.25; sheet scrap, bundled, $12.25 to $12.50.

Coke.—Water in all the reservoirs in the Connellsville region is very low, and, unless there is a heavy rain, the present supply will be withdrawn in the next week or ten days. High sulphur river water is being used in many cases with the result that the coke is very high in sulphur. A number of operations are out and fully half of the active plants will be out unless rain intervenes. For immediate shipment high prices are being paid for furnace coke, while for delivery the first half of 1905 $2.10 was paid this week. Foundry coke for delivery the first half of the year is held at $2.25 to $2.50 and a large number of contracts are being placed at these prices. A few operations are holding foundry coke at $3 for future delivery. During the week ending November 5 the production of the upper region was 196,624 tons, while the lower region produced 64,444 tons. In the two regions about 8,000 ovens are idle.

CHICAGO.

(Special Telegram.)

CHICAGO, Nov. 16.—It is rumored that the Republic Iron & Steel Co. will build a rod mill at the Youngstown plant. The probable foundation for this report is that the company has no doubt considered, along with the improvements and increased capacity at Youngstown, the establishment of additional mills for the manufacture of steel output into various finished articles, such as rods, rails, sheet bars, etc., etc. But so far, it is stated by officials of the company, that no contracts have been let for such additions, with the exception of those covering equipment necessary for the production of sheet bars and standard steel rails at the Bessemer plant at Youngstown.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, Nov. 15.

Pronounced activity in iron and steel continues. Under the pressure of heavy buying, pig iron has advanced another 50 cents a ton. Southern No. 2 foundry is now selling on the basis of $13 Birmingham, or $16.65 Chicago, and Northern irons at $16 Chicago for the same grade. The market is exceptionally strong and with an advancing tendency. Finished materials have forged to the front in the week and in point of interest have occupied first place. The belief that an advance in prices would be made on some products controlled by pool agreements, at the meetings of the different associations to be held this week, induced many large interests to cover for their requirements up to July next. Bars, plates, structural shapes, merchant pipe, wire nails and fencing, spikes and bolts, and other materials have been purchased in large quantities in the last ten days. The tonnage placed on mill books in all districts since Nov. 1 amounts to several hundred thousand tons, and had producers been willing to sell for the second half, these figures could have been considerably increased. Premiums of $1 to $2 a ton are being asked for quick deliveries of billets, and an advance is expected to be made official at the meeting of the pool this week. The advance of $2 a ton in steel bars made two weeks ago by some Central Western interests is still being maintained, though these mills are booking little if any tonnage at the new

figures, a result which it was hoped would come from this step. Bar iron has been put up another $1 a ton, and is now selling on the basis of 1.50c Chicago, with mills chary of accepting further business. Much interest centers in the rail situation and the action that will be taken this week on prices. Several railroads have been negotiating with mills for their needs in the coming year and the prospects are that a heavy tonnage will be placed as soon as the decision of the pool is announced. It is not thought in this market there will be a great change in prices of rails for the coming year in view of the improved conditions of the iron and steel trade, though it is expected some concessions will be made. Scrap and coke are strong and both in good demand. A deadlock seems to exist between sellers and buyers of old material, the former declining to negotiate except on the basis quoted and the latter refusing to pay such high prices. Sheets, which have been one of the weakest products on the finished list, show considerable improvement both in the way of demand and in the firmness of prices.

Pig Iron.—The local market is in much the same condition as it was a week ago, except that prices of both Northern and Southern grades are generally 50 cents a ton higher. Some No. 2 iron sold at $12.75 Birmingham in the fore part of the week, but the market is now strong at $13 Birmingham for No. 2, or $16.65 Chicago. Northern furnaces are quoting at $16 Chicago for No. 2 foundry. Southern quotations range all the way from $13 to $13.50 Birmingham, some interests being willing to sell freely at $13, while on the other hand the establishment of $13.50 within a short time is predicted. Practically all the tonnage booked in the past seven days has been for delivery in the new year, a good share of which runs into the second quarter. The Virginia furnaces are practically the only Southern producers at present willing to sell at prevailing prices for deliveries between March and July, 1905. Virginia irons have been advanced to the equivalent of $13 Birmingham for No. 2. Practically the entire output of furnaces in the Chicago district up to the end of the first quarter has been contracted for, and more stacks must be placed in blast in the meantime, which is expected, to prevent these interests being practically out of the market for this period. Northern Scotch foundry and Lake Superior charcoal have both been advanced 50 cents a ton, and are now selling at $17 Chicago. We have revised our quotations, and quote as follows:

Lake Superior Charcoal	$ 17 00
Northern Coke Foundry No. 1	16 50 to 17 00
Northern Coke Foundry No. 2	16 00 to 16 50
Northern Coke Foundry No. 3	15 50 to 16 00
Northern Scotch Foundry	17 00
Ohio Strong Softeners No. 1	17 80 to 18 30
Ohio Strong Softeners No. 2	17 30 to 17 80
Southern Coke Foundry No. 1	17 15 to 17 65
Southern Coke Foundry No. 2	16 65 to 17 15
Southern Coke Foundry No. 3	16 15 to 16 65
Southern Coke Foundry No. 4	15 90 to 16 15
Southern No. 1 Soft	17 15 to 17 65
Southern No. 2 Soft	16 65 to 17 15
Southern Gray Forge	15 65 to 15 90
Southern Mottled	15 65 to 15 90
Southern Silveries (4% to 6% Silicon)	17 90 to 18 40
Jackson Co. Silveries (6% to 8%)	20 20 to 20 70
Jackson Co. Silveries (8% to 10% Silicon)	20 70 to 21 20
Alabama and Georgia Car Wheel	18 65 to 19 15
Malleable Bessemer	16 50 to 17 00
Basic Iron	16 65

Billets.—There is an excellent demand for both forging and re-rolling billets, and all the mills in the West are asking premiums of $1 to $2 a ton for early deliveries. An advance of $2 a ton in prices is expected as the outcome of the pool meeting this week, in anticipation of which producers have been selling in limited quantities. We quote Chicago deliveries on forging billets, 4 x 4 and larger, up to but not including 10 x 10, $24.50. Re-rolling billets, Bessemer or open-hearth, 4 x 4 and larger up to .25 carbon, $22.50; up to and including .60 carbon, $1 extra. Billets, 3⅞ inches and smaller, and sheet and tin bars, $24.50. Wire rods, $26 Pittsburg.

Bars.—The demand for steel bars has been exceptionally heavy in the week under review, the tonnage placed on mill books in this period being called "phenomenal" by some interests. The announcement of the $2 advance by interests farther to the East two weeks ago and the fear that it would become general was largely the cause of the rush to cover, many large interests taking part in the movement to protect themselves at the prevailing prices. Bar iron has advanced in sympathy with the firmness in steel, and is now quoted at 1.50c Chicago, with strong leanings towards higher figures. There has been a brisk demand for this material, but mills are loath to sell far ahead. We quote prices for Chicago delivery, mill shipments, as follows: Bar iron, 1.50c to 1.55c; soft steel bars, 1.46½c to 1.56½c; soft steel angles, less than 3 x 3, 1.56½c; hoops, 1.71½c, full extras. Local jobbers quote iron, 1.70c to 1.75c base, full extras; hoops, 2c to 2.10c rates, full extras.

Sheets.—There is a very general improvement both as to the tonnage in demand and in the firmness of prices. Several mills have withdrawn from the market anticipating higher prices in the near future, while others are asking higher prices than those quoted below. It is still possible, however, to close business at these figures. We quote mill shipments, carload lots, Chicago delivery, as follows: Nos. 9 and 10, 1.71½c to 1.76½; Nos. 11 and 12, 1.76½c to 1.81½c; Nos. 13 and 14, 1.81½c to 1.86½c; Nos. 15 and 16, 1.91½c to 1.96½c. On box annealed, one pass, cold rolled: Nos. 18 and 20, 2.01½c to 2.06½; Nos. 22 and 24, 2.06½ to 2.11½c; Nos. 25 and 26, 2.11½c to 2.16½c; No. 27, 2.16½c to 2.21½c; No. 28, 2.26½c to 2.31½c; No. 29, 2.41½c to 2.46½c; No. 30, 2.51½c to 2.56½c. We quote lots from jobbers' stocks as follows: No. 10, 1.90c to 2c; No. 12, 1.95c to 2.05c; No. 14, 2c to 2.10c; No. 16, 2.10c to 2.20c; No. 18, 2.20c to 2.30c; No. 20, 2.25c to 2.35c; No. 22, 2.30c to 2.40c; No. 24, 2.35c to 2.45c; No. 26, 2.40c to 2.50c; No. 27, 2.50c to 2.60c; No. 28, 2.60c to 2.70c; No. 29, 2.70c to 2.80c. Galvanized sheets are fair and prices steady. We quote Pittsburg discounts, f. o. b. mill, 80 and 5 to 80 and 10. For shipments from stock, we quote heavy gauges and wide widths, 75 and 5 to 75 and 10 percent; for light gauges, 75, 10 and 7½ percent to 80 percent.

Structural Steel.—Mills report a large business placed on their books in the past week. No building contracts of any proportions have been let, the week's business being made up of jobbers' and consumers' orders for stock purposes. Prices are very firm, and we quote mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in. inclusive, 1.56½c; angles, 3 to 6 in., ¼-in. and heavier, 1.56½c; angles, larger than 6 in. on one or both legs, 1.66½c; beams, larger than 15 in., 1.66½c; zees, 3-in. and over, 1.56½c; tees, 3-in. and over, 1.61½c, with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. Store prices on structural materials are 1.80c to 1.90c for angles, beams, channels, base sizes, with 1.90c to 2c for 18, 20 and 24-in. beams; tees and zees, 1.85c to 1.95c. These prices are for either random lengths or cut to lengths.

Plates.—Plates have shown a wonderful improvement since the first of the month, the amount of business received by one interest approximating nearly 100,000 tons. Shipbuilders and railroads have been the heaviest buyers, though the regular trade has greatly increased its orders. Prices are firm and without change. We quote carload lots, Chicago delivery, as follows: Tank steel, ¼-in. and heavier, 24-in. wide and under, rectangular plates only, 1.46½c base; over 24-in. to 100-in. wide, 1.56½c base; flange steel, 1.66½c base; marine steel, 1.76½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, 5c extra. Prices from store are as follows: Tank steel, ¼ in. and heavier, 1.80c to 1.90c; 3-16, 1.90c to 2c; No. 8, 1.90c to 2c; flange steel, 2.05c to 2.15c.

Rails and Track Supplies.—Interest in the West centers in the probable action of the rail pool in determining prices of standard rails for the coming year. Several Western systems have been negotiating with mills for their requirements

for 1905, and as soon as the result of the meeting is known, a large tonnage it is expected will be placed. The demand for light rails and track supplies keeps up, the output of all the Western producers going into immediate consumption. We quote heavy sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, $21 to $23; track supplies, f. o. b. Joliet mill, angle bars, 1.30c; spikes, first quality, 1.60c to 1.65c; track bolts, 3¼ x ¾, with square nuts, 2.25c to 2.30c per 100 lb.; with hexagon nuts, 2.40c to 2.45c.

Merchant Steel.—The volume of specifications and new business has been so heavy in the last two weeks, that the Western offices of Eastern producers are now compelled to submit every inquiry to the home office before quoting on same. The outlook is very bright and prices are extremely strong. We quote mill shipments, Chicago delivery, as follows: Spring steel, 1.85c; sleigh shoe, flat sizes, 1.51½c; concave and convex, 1.60½c to 1.71½c; cutter shoe, 2.25c; smooth finished machinery steel, 1.71½c; smooth finished tire, 1.66½c; plow steel, 2.20c and upwards, according to quality; toe calk steel, 2.01½c; crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up; cold rolled shafting, 52 percent from list in carload lots, and 47 percent discount in less than carload lots.

Merchant Pipe.—Continued good business is reported by the leading producer, specifications and supplementary orders coming in with great freedom. Through a printer's error, our quotations of last week were not changed to conform with the advance of $2 a ton made Nov. 1. The new prices on carload lots, mill shipments, random lengths, f. o. b. Chicago, are as follows:

MERCHANT PIPE.

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	67.35	51.35	65.35	49.35
⅜ and ½ inches	71.35	59.35	69.35	57.35
¾ to 6 inches	75.35	65.35	73.85	63.85
7 to 12 inches	70.35	55.35	68.85	53.35

Boiler Tubes.—Jobbers report a handsome increase in the volume of business placed, as well as a great improvement in the outlook. Prices are without change, and we quote mill shipments, Chicago delivery, as follows:

BOILER TUBES.

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	46.35	41.35	52.35
1¾ to 2¼ inch	58.35	41.35	40.35
2½ inch	60.35	46.35	43.35
2¾ inch to 5 inch	66.35	53.35	Up to 4 inches.
6 to 13 inch	58.35	41.35	50.85

The following are the agreed discounts from store:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches, inclusive	42½	37½	40
1¾ to 2¼ inches, inclusive	52½	35	37½
2½ inches, inclusive	55	37½	40
2¾ to 5 inches, inclusive	62½	47½	47½
6 inches and larger	52½	35	..

Cast Iron Pipe.—Demand for cast iron pipe is not important, the dullness, however, being a seasonable one. The outlook is very good, and prices are firm. We quote carload lots, Chicago delivery, as follows: Four-in. water pipe, $26.50; 6-in. and larger sizes, $25.50; gas pipe, $1 a ton higher.

Wire Products.—Owing to the fear that prices are expected to be advanced in the near future, mills are being literally snowed under with requests for prompt shipment and with supplementary orders. The entire output of Western producers goes into immediate consumption, but despite this mills are falling behind in their deliveries. We quote carload lots to jobbers, Chicago delivery, mill shipments, as follows: Wire nails, 1.75c; painted barb wire, 1.90c; galvanized barb wire, 2.20c; smooth annealed wire, 1.60c; smooth galvanized wire, 1.90c; polished staples, 1.85c; galvanized staples, 2.15c. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10c extra on less than carload lots. Bale ties are unchanged at 82½c and 5 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet and DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Foundry Coke.—Demand for both foundry and furnace coke continues very brisk and prices are strong. Early deliveries are hard to obtain. We quote Connellsville, 72-hour grades, $2.25 to $2.50 at the ovens, or $4.90 to $5.15 Chicago. Coke from Virginia and West Virginia ovens, $1.90 to $2.15.

Old Material.—While there is a big demand for scrap, sales are not of equal proportions. Dealers decline to budge from their prices, and melters, except where their needs are pressing, are equally firm in their refusal to meet same. As a result, an incipient deadlock exists. All the dealers have large stocks in their yards and are constantly adding to them wherever possible. The only new railroad list that has been put out in the past week is that of the Rock Island, for 4,000 tons. The market is very strong, and we have advanced our quotations on practically the entire list. Dealers' selling prices, gross tons, are as follows:

Old steel rails (4 feet and over)	$14 75 to 15 25
Old steel rails (less than 4 feet)	13 25 to 13 75
Old iron rails	19 50 to 20 00
Relaying rails, subject to inspection	21 50 to 22 50
Relaying rails, subject to inspection	19 00 to 20 00
Old wheels	13 75 to 14 25
Heavy melting steel	12 00 to 13 00
Mixed country steel	9 75 to 10 25
Low phosphorus scrap (.04 and under)	13 50 to 14 00

The following quotations are for net tons:

No. 1 R. R. wrought	14 75 to 15 25
No. 2 R. R. wrought	13 75 to 14 25
Shafting	13 25 to 13 75
Dealers' Forge, No. 1	10 50 to 11 00
Wrought pipe and flues	10 50 to 11 00
No. 1 cast, 150 lb. and less	12 50 to 13 00
No. 1 mill	8 00 to 8 50
Country sheet	5 50 to 6 00
No. 1 boilers, cut	10 50 to 11 00
Boiler punchings	10 50 to 11 00
Iron car axles	19 00 to 19 50
Steel car axles	16 50 to 17 00
Iron axle turnings	9 00 to 9 50
Steel axle turnings	9 00 to 9 50
Cast borings	6 25 to 6 75
Mixed borings, etc	6 25 to 6 75
Wrought turnings	9 50 to 10 00
Machine shop turnings	9 50 to 10 00
Railroad malleable	11 75 to 12 25
Agricultural malleable	10 50 to 11 00
Stove plate and light cast scrap	10 00 to 11 00
Old iron splice bars	14 50 to 15 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Nov. 16.

It is estimated that in the first ten days of November a million tons of ore were shipped, but the weather of the past three or four days has been unfavorable for navigation and shipments have been considerably reduced. Representatives of furnaces which had not covered their requirements for the winter have been eagerly seeking ore during the past week and have found it scarce, with prices still higher than we quoted last week. Sellers who had anticipated that the present would be a dull time find that the reverse is true and they are kept busy conferring with buyers. We revise prices as follows: Old range non-Bessemer, $3 to $3.25; old range Bessemer, $3.65 to $3.75; Mesabi non-Bessemer, $3 to $3.25; Mesabi Bessemer, $3.15 to $3.50.

Freight rates are firm at the advance made the early part of last week, on a basis of 75 cents from the head of the lakes.

Pig Iron.—A majority of Ohio furnaces last month sold more than double their output and sales for the first two weeks of this month are being made at about the same rate. The usual quotation on No. 2 foundry is now $15 at the furnace, but some furnaces have withdrawn this quotation and are asking $15.50 and even $16. These higher quotations do not, however, represent the market, as they come from furnaces which have little iron for sale for delivery before the first of next July and are

not anxious to make contracts. Buyers do not object to $15, and some are willing to contract for the first half at that price, but sellers say that as contracts seldom amount to more than a buyer's option and are not effective when the market falls, they prefer to take their chances on getting higher prices and not make contracts. The Cleveland price for No. 2 is $15 at the stacks. In the South some iron has been sold within a few days at $12.50, but $13 is the usual price. Very little is being sold in this locality. Coke is an important factor, as it is still scarce, selling as high as $2.15 for furnace and $2.50 for foundry, and delivery is much delayed. We quote as follows for Cleveland delivery:

Bessemer	$15 00 to 15 35
No. 1 Foundry	15 50 to 16 00
No. 2 Foundry	15 00 to 15 85
No. 3 Foundry	14 00 to 14 50
No. 2 Southern	16 35 to 16 85
Gray Forge	14 00 to 14 50
Gray Forge, Southern	14 50 to 15 00
Lake Superior charcoal	15 50 to 16 00

Finished Material.—Sales have been very heavy and, with the single exception of bar iron, the market is in better condition than at any time since the recent improvement set in. The report that at meetings to be held in New York this week the price of billets would be advanced and that probably similar action would be taken concerning steel bars has been a factor in bringing buyers into the market, but, aside from that influence, there has been a strong, healthy demand. Owing to the high price of scrap, makers of bar iron declare that it is impossible to sell at recent prices without loss. One of the leading producers has advanced its price to 1.45c Youngstown, and is not willing to sell in large quantities. Other mills are having trouble in selling at 1.35c at their plants and fear they will be compelled to shut down unless the price of scrap declines. The sheet business is in very satisfactory condition as to both orders and specifications, but an advance of prices is not anticipated. The prices of the principal producers through jobbers are as follows, Cleveland delivery, the freight from Pittsburg being 9½ cents: Mill sales of black sheets in carload lots, No. 10, 1.64½c; No. 11-12, 1.69½c; No. 14, 1.79½c; No. 16, 1.89½c; No. 27, 2.14½c; No. 28, 2.24½c. Galvanized, mill sales, No. 14, 2.24½c; No. 16, 2.34½c; No. 18-20, 2.49½c; No. 22-24, 2.64½c; No. 24-26, 2.84½c; No. 27, 3.04½c; No. 28, 3.24½c. Out of stock black sheets: ¼-in., 1.90c; 3-16-in., 2c. Blue annealed: No. 10, 2.05c; No. 12, 2.10c; No. 14, 2.15c; No. 16, 2.25c. One pass cold rolled: No. 18-20, 2.35c; No. 22-24, 2.40c; No. 26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 30, 3c. Galvanized out of stock: No. 16, 2.60c; No. 18-20, 2.70c; No. 22-24, 2.85c; No. 26, 3.05c; No. 27, 3.25c; No. 28, 3.45c; No. 30, 4.25c.

Old Material.—There has been little change of quotations, but recent high prices are well maintained and the demand is strong. We quote as follows, gross tons, Cleveland:

Old iron rails	$18 50 to 19 50
Old steel rails (over 6 feet)	14 00 to 15 00
Old steel rails (under 6 feet)	14 00 to 15 00
Old car wheels	12 50 to 13 00
Steel boiler plate	9 50 to 10 50
Malleable iron (railroad)	12 50 to 13 00
Malleable iron (agricultural)	9 50 to 10 00
Heavy steel	13 50 to 14 00

We quote as follows, net tons:

No. 1 R. R. wrought	$13 00 to 13 50
No. 1 busheling	12 50 to 13 00
No. 1 machine cast	13 00 to 13 50
Iron axles	17 50 to 18 00
Axle turnings	9 00 to 10 00
Wrought turnings (free from cast)	8 00 to 8 50
Grate bars	8 00 to 8 50
Pipes and flues	10 00 to 10 50
Tank iron	10 00 to 10 50
Hoop and band iron	8 00 to 9 00
Sheet iron	6 00 to 7 00
Wrought drillings	8 00 to 8 50
Stove plate	8 00 to 9 00
Steel axles	16 00 to 17 00
Cast borings	5 25 to 5 75

CINCINNATI.

Nov. 15.

The coke market is strong with some advance in prices. Foundry coke is quoted at $2.50 to $2.65 f. o. b. Connellsville, and furnace coke is ranging from $2 to $2.15 f. o. b. ovens.

Pig Iron.—The business of the week shows evidence of some subsiding of the urgent demand under which the rapid advance in prices two weeks ago was brought about. The inquiry at present is rather moderate. At Springfield, O., sales aggregating about 3,000 tons of Northern iron were made in lots from 250 tons up to 1,000 tons. Prices on these sales range from $14.50 to $15 for No. 2 foundry at furnace. An inquiry is in the market for 2,500 tons by analysis for delivery this year to a point in Michigan. A sale of 5,000 tons of foundry iron to a large consumer in the Central West is reported. Since our letter last week the market has continued firm with some advancing prices. Virginia furnaces have advanced their figures. The general asking price today for Southern irons is $13 for No. 2 foundry, Birmingham, and sales have been made at this price. Some well sold up furnaces in the South are quoting $13.50 Birmingham. The lowest quotation obtainable is $12.75 Birmingham for No. 2 foundry, which comes from a furnace with a 25c freight rate differential. No change has occurred in a general way and reports regarding consumption and probable increase in supplies are about the same. Southern furnace capacity is still retarded in development by shortage of coke, and nothing is reported giving encouragement to the view that it can be obtained in sufficient quantity to relieve the situation in the near future. Northern irons are now quotable at $15 furnace for No. 2 foundry, and only competition against furnaces located nearer the purchaser brings any concession from this basis. Current quotations f. o. b. Cincinnati are as follows:

Southern Foundry No. 1	$16 00 to 16 25
Southern Foundry No. 2	15 50 to 15 75
Southern Foundry No. 3	15 00 to 15 25
Southern Foundry No. 4	14 75 to 15 00
Southern Foundry No. 1 soft	16 00 to 16 25
Southern Foundry No. 2 soft	15 50 to 15 75
Gray Forge	14 50 to 14 75
Northern Foundry No. 1	16 65
Northern Foundry No. 2	16 15

Finished Material.—The market continues firm with bar iron leading in interest and prices higher. Bar mills are said to be refusing to quote for next year's delivery. The general distributive and jobbing trade in steel material is reported as improving. Bar iron is now quoted at 1.45c; steel bars at 1.43c, half extras, with dealers quoting 1.60c to 1.75c for iron and steel out of store. Galvanized sheets are at 80 and 10 percent off. We quote black sheets, No. 27, at 2.25c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.60c; No. 27, 2.50c; No. 16, 2.10c; No. 14, 2c; No. 12, 1.95c; No. 10, 1.90c. Tank plates are dull and sell out of store at 1.85c for ¼-in. and 1.95c for 3-16-in., No. 8 and No. 10. Beams and channels are quoted at 1.85c from stock, and angles at 1.85c to 1.90c for base sizes.

In merchant pipe a strong tone prevails and independent mills are more generally quoting on the schedule of the leading interests. Boiler tubes are strong with some prices slightly higher, but quotations are not openly made and are only given on application with specifications. Car lots are quoted as follows f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	67.35	51.35	65.35	49.35
⅜ and ½ inches	71.35	59.35	69.35	57.35
¾ to 6 inches	75.35	65.35	73.85	63.85
7 to 12 inches	70.35	55.35	68.85	53.35

Old Material.—The market is firm and quotations for several descriptions are higher. Axles are particularly strong and new as well as old axles have had an advance during the week. Scrap of all kinds is difficult to buy, as holders are not inclined to offer it. The strength in pig iron has had an important effect on the scrap market. We quote:

Old No. 1 railroad wrought, net tons	$13 00 to 13 50
Cast machine and foundry, net tons	11 00 to 11 50
Old iron rails, gross tons	15 00 to 15 50
Old steel rails, gross tons	12 00 to 12 50
Old short lengths, gross tons	12 00 to 12 50
Old iron axles, net tons	16 50 to 17 00
Stove plate, net tons	9 00 to 9 50
Wrought turnings, net tons	10 00 to 10 50
Cast borings, net tons	6 00 to 6 50

Announcement is made by Robert Field, Wm. Wieman and C. J. Burton, 1101-03 Traction Bldg., Cincinnati, that on Nov. 8 they formed the Robert Field Sales Agency, which will carry on a general commission business in pig iron and foundry coke. The territory covered is included between Buffalo and Pittsburg on the east and Chicago and St. Louis on the west. The members of the Robert Field Sales Agency will continue to serve the Sloss-Sheffield Steel & Iron Co. as sole selling agents for the Central West.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Nov. 15.

Pig Iron.—For four days following the election the local pig iron market saw its greatest activity for weeks past, with prices the highest that have been attained this year. During the past two days, however, the market has been very dull, with no change in prices, but with sales and inquiries showing a notable falling off. The aftermath of the heavy buying of the past six weeks is that buyers have not only covered for the remainder of this year, but many of them have done so for the first quarter of next year also. The fact has also impressed itself that many who purchased for extended delivery did not do so with reference to orders on hand or in prospect, but simply because they wanted to be secured against further advances. At this writing Southern irons are at a standstill, the leading furnaces practically being out of the market for any delivery, some on formal announcement and others because buyers will not do business at their figures. Southern No. 2 foundry is quoted at $13 to $13.50 for delivery this year, and at least for the first, if not second, quarter of next year. Northern irons for the same delivery are very firm, No. 2 foundry ruling strong at $15.50 at furnaces. There has been some cabling done in foreign irons, but no transactions have been closed, nor is there any likely to be in the near future, for with Middlesborough No. 3 selling around 46s, American brands at seaboard points have an advantage of approximately $1.50 per ton. New York quotations at tidewater, for delivery any time within the next four months, are as follows: Northern No. 1 foundry, $16.70 to $16.95; No. 2 foundry, $16.20 to $16.45; No. 2 plain, $15.70 to $15.95; No. 1 Southern, $17 to $17.25; No. 2 foundry, $16.50 to $16.75; No. 3 foundry, $16 to $16.25; No. 4 foundry, $15.50 to $15.75.

Rails.—Current business dull pending coming meeting of rail pool, which is likely to be held on Thursday. Standard sections are $28 at mill.

Finished Iron and Steel—All branches of the finished material market, with the exception of sheets, are awaiting the outcome of the meetings of the various pools, which will be held tomorrow. During the past week structural shapes have been fairly active, with railroads placing some small orders, the largest being one for about 1,400 tons, which went to the leading interest. Independent companies report trade to be extremely good, due largely to their ability to adapt themselves to the peculiar specifications that have been running. The Western lines of the Pennsylvania Railroad and the Chicago & Northwestern Railroad are expected to give orders for 3,000 tons each shortly, for track elevations. Iron bars are particularly strong, a premium of $2 per ton over the pool price on an order for 2,000 tons for extended delivery having been offered and refused. Plates are stronger and more active than for weeks past, new business being particularly gratifying. Sheets are in good demand, with good premiums being paid for extended delivery. New York prices at tidewater follow: Angles, 3 to 6 in. x ¼ in. and heavier, 1.54½c; beams, 3 to 15 in., 1.54½c; channels, 3 to 15 in., 1.54½c; beams, 18, 20 and 24 in., 1.64½c; tees, 3 x ¼ in. and heavier, 1.59¼c; plates, carloads, tank, 1.54½c; flange, 1.64½c; marine and ordinary fire box, 1.74½c; refined iron and soft steel bars, 1.44½c; sheets, in carload lots, New York, No. 28, black, 2.30c to 2.35c; galvanized, 3.30c to 3.35c.

Old Material.—The market during the past week has been very strong and prices for all kinds of material are now the highest of the year. Consumers find the situation much to their dislike and are only providing for immediate requirements on the most favorable terms they can get. Heavy steel scrap is particularly strong, and in good demand, at prices ranging from $13.50 to $14.50. Old rails continue strong, with railroads averse to parting with their holdings at present prices. We quote f. o. b. cars:

Old iron rails	$15 00 to 15 50
Old steel rails, long lengths	13 50 to 14 00
Old steel rails, short pieces	13 00 to 13 50
Relaying rails	19 00 to 20 00
Old car wheels	12 25 to 12 75
Old iron car axles	17 00 to 18 00
Old steel car axles	14 00 to 15 00
Heavy melting steel scrap	13 50 to 14 50
No. 1 railroad wrought scrap	14 50 to 15 50
Iron track scrap	13 50 to 14 00
Wrought pipe	9 50 to 10 00
Ordinary light iron	9 00 to 10 50
Cast borings	5 75 to 6 50
Wrought turnings	8 25 to 9 00
No. 1 machinery cast	11 75 to 12 25
Stove plate	9 25 to 9 75

BIRMINGHAM.

BIRMINGHAM, Ala., Nov. 14.—Alabama pig iron is now selling between $13.25 and $13.50 per ton, No. 2 foundry. The Sloss-Sheffield Steel & Iron Co. sold 12,000 tons of iron at this price up to noon today, while inquiries have been received for a large quantity of iron by others. The indications are that by the middle of the week $13.50 will be the firm price for No. 2 foundry. There is not a great amount of iron obtainable in this district, the prospect as to production not being as bright as it might be and the stocks of iron on hand being somewhat limited. Prominent iron men in this section still predict $14 and $15 per ton iron before the end of the year. Sales made for delivery before the end of the year will now require every ton that can be made with the furnaces in operation. The sales of iron made for delivery during the first half of the coming year will aggregate well already and there is still a lively inquiry.

As stated by a prominent iron man, the Alabama pig iron market is as active as "pizen" and there is no telling what the market is going to do, it being a runaway market altogether. Furnace companies in this district with any iron at all on their yards can find a good, strong demand for it, delivery before the end of the year or immediately after. Local consumers, those within a territory of 150 miles of the furnaces, are paying the high prices demanded and are specifying almost immediate delivery. There has been no increase in the production in this section in the past week. The coal miners' strike is still on and some inconvenience is felt in more than one quarter. The Tennessee Coal, Iron & Railroad

Co. has six furnaces in operation, with four of them constantly making basic iron for the steel plant at Ensley, while the other two are not making their full capacity of iron. The Sloss-Sheffield Steel & Iron Co. still has five furnaces in operation. The Republic company has two of its three furnaces at Thomas in blast. The Alabama Consolidated Coal & Iron Co. has three furnaces making iron. The Sloss-Sheffield Steel & Iron Co. will hardly have 50,000 tons of iron on its yards when the new year comes in. There will be some extra shipments from the piles between now and the first of January, waybills being filed with the railroads already.

J. W. McQueen, second vice president and general sales agent of the Sloss-Sheffield Steel & Iron Co., states that the iron market is exceedingly strong and that there is a big demand. There are indications that all the iron that can be manufactured in this district next year will have a strong demand and that high prices will prevail for all the iron that will be delivered next year. This company has been slow in selling until the high prices came in and since $12 rates have been announced quite a number of orders have been booked. Last Friday the rate was given as $13 for the maximum. By noon today the rate was given at $13.50 per ton. With a few more orders sent in at the rate they came today, it is not improbable that the quotations will ascend fifty cents before the end of the week.

There is a denial here that the Sloss-Sheffield Steel & Iron Co. and the Tennessee Coal, Iron & Railroad Co., the two largest iron producing companies in Alabama, were about to be consolidated. President J. C. Maben and President Don H. Bacon, of the companies named, were in New York last week, and both upon being interviewed denied knowing of negotiations looking to the consolidation of interests. The rumors were widespread in this State. It is learned that United States Steel Corporation interests have been buying Sloss-Sheffield stock right along and at the annual meeting next March it may show some voice in the management of the concern. The Sloss-Sheffield Co. is in fine condition, physically and otherwise.

The following quotations are mentioned here for pig iron: No. 1 foundry, $13 to $13.50; No. 2 foundry, $13 to $13.50; No. 3 foundry, $12 to $12.50; No. 4 foundry, $11.50 to $12; gray forge, $11 to $11.50; No. 1 soft, $13.50; No. 2 soft, $13 to $13.50.

The furnace operators who are fighting for "open shop" at their coal mines state that the fight will be continued to the end. The leaders of the union miners assert that they will hold out for an indefinite period.

PHILADELPHIA.

Nov. 15.

The consumption of pig iron is increasing and general conditions are very favorable. It is generally conceded that higher prices in finished materials must soon be made and in the meantime sales are numerous and frequently for large tonnages.

Pig Iron.—The market is very strong and prices have advanced, No. 2 X foundry being quoted at $15.50 to $15.75. We quote as follows for Philadelphia and nearby deliveries: No. 1 X foundry, $16.75 to $17; No. 2 X foundry, $16 to $16.50; No. 2 X plain, $15.50 to $15.75; gray forge, $14.75 to $15; basic, $14.75 to $15.

Finished Material.—The demand is steadily improving. Plates are selling more freely and in structural material there is greater activity. Buyers of steel bars are placing orders, anticipating higher prices.

Old Material.—The market is firm but irregular. Stocks are rather light and are firmly held. We quote as follows: No. 1 steel scrap, $14.25 to $14.75; low phosphorus scrap, $18 to $18.50; old steel axles, $17.50 to $18; old iron rails, $17 to $17.50; old iron axles, $20 to $21; old iron rails, $17 to $17.50; old car wheels, $13.75 to $14; choice railroad No. 1 wrought, $16.50 to $17; machinery cast, $13.50 to $14; No. 2 light scrap (forge), $11 to $11.50; light scrap (ordinary), $9.50 to $10; wrought turnings, $9 to $9.50; cast borings, $7.25 to $7.50; stove plate, $11 to $11.50; wrought iron pipe, $12.50 to $12.75.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Nov. 15.

Pig Tin.—Although prices are a little higher than those given in our last report, activity is not as marked as it was then, consumers evidently being pretty well covered for the near future. The London market has been very strong, and prices advanced appreciably. Today's closings follow: Spot, 28.95c to 29.15c; November, 28.85c to 29.10c; December, 28.75c to 29.00c. London's closings today follow: Spot, £132 7s 6d; futures, £131 17s 6d. Arrivals at Atlantic ports for the month to date aggregate 980 tons, with 1,285 tons afloat.

Copper.—The leading producers made several further advances in asking prices during the week, aggregating ¼c in all grades. The volume of business has been increasing also, but there is a feverish feeling prevailing, which has made buyers act very cautiously and made many conclude that the bullish movement has been carried to dangerous limits. London has been strong and active in sympathy with the local market, and prices have advanced over £3 for the week. Today's closings follow: Lake, 14½c to 14⅞c; electrolytic, 14½c to 14¾c; casting, 14½c to 14⅝c. London's closings today follow: Spot, £66 7s 6d; futures, £66 15s. Exports for the month to date amount to 5,527 tons.

Lead.—Spot is very scarce and prices have advanced considerably, being nominally 4.60c to 4.70c for spot. St. Louis and London are stronger at 4.25c to 4.35c, and £13 13s, respectively.

Spelter.—Is firm and higher at 5.45c to 5.55c for spot. St. Louis is stronger at 5.35c. London advanced to £24 15s.

Antimony.—Prices have been exceptionally strong, Cookson's being 8.00c to 8.75c; Hallett's, 8.00c to 8.50c; other grades, 7.75c to 8.50c.

Quicksilver.—We quote $40 per flask of 76½ lb. in lots of 100 flasks. London is £7 15s.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c to 60c for small quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, Nov. 15.

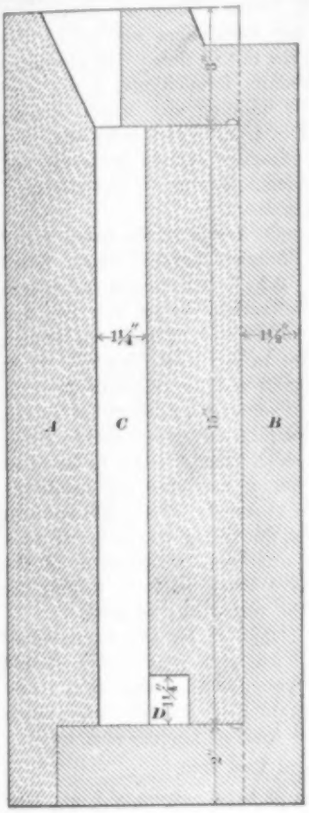
The higher prices asked for all metals, with the exception of pig tin, as a result of the speculation in these products on the various stock exchanges, have diminished the consumptive demand in this market. Melters have not been covering for their requirements as freely as the improved business conditions would warrant, and the assumption is they will decline to buy until the market is lower. We have revised our prices, and quote as follows: Lake copper in carloads, 14½c, and 14¾c to 15c for lesser quantities; casting, 14⅜c for carloads, and 14¾c for smaller lots. Pig tin, carloads, 29¾c, and 30¼c to 30½c for less than carload lots. Spelter, 5½c, carload lots, and 5¾c for less than carload lots. Sheet zinc, 6 1-10c for carload lots of 600-lb. casks, and 6⅜c to 6½c for less than carload lots. Pig lead is very scarce, and is strong at 4.35c for 50-ton lots, 4.40c for carload lots, and 4.55c for smaller lots.

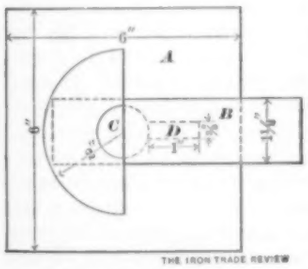
There is a brisk demand for old metals and prices are firm. We quote copper wire and heavy, 12½c; copper bottoms, 11¼c; copper clips, 12c; red brass, 11¼c; red brass borings, 9¼c; yellow brass, heavy, 8¼c; yellow brass borings, 7½c; light brass, 6¼c; tea lead, 4c; zinc, 3.90c.

AN IMPROVED TEST BAR.*

BY J. F. BROWN.

There has been so much written and so many arguments used, showing the necessity of having a standard test bar for cast iron, that nothing can be added to convince foundrymen that a test bar which will give all the information possible concerning the physical properties of the casting it represents is greatly to be desired. In the early part of this year a committee was formed, by the American Society for Testing Materials, for the purpose of deciding upon a set of specifications for cast iron. This committee proposed for adoption what they called the "arbitration bar," which, as you all know, is a bar 15 in. long and 1¼ in. diameter, cast on end in dry sand. Now, this bar was the result of much study and experiment by some of our very best foundrymen, and the universal adoption of it will go far toward placing the whole question of testing cast iron upon a fixed basis. The physical test is the final and most important one for all kinds of castings and any idea which may help to make that test more nearly perfect should be laid before foundrymen and thoroughly discussed with a view to its adoption.





A NEW TEST BAR.

Before we adopted the "arbitration bar" we used to take four separate tests from each air furnace heat, one each for chill, chemical analysis, tensile test and shrinkage, paying no regard to transverse strength and deflection. Now with the "arbitration bar" we could get transverse, tensile and chemical tests, but not shrinkage and chill, and to get these very important points of information I introduced what I venture to call an improvement on the "arbitration bar." We have used this new bar with great success for about six months and it is with the hope that it will be thoroughly discussed and tried in other foundries that I now present it to you.

Taking it for granted that a bar 15 in. long and 1¼ in. diameter was all that could be desired with regard to length and section, we adopted these dimensions, then made a core A and cast iron yoke B, placed as shown in the sketch, and pouring it from the top we produce the bar C, which has a small projection D.

After cleaning the bar we knock off the projection and measure the depth of chill, then place it between the yoke in the same position as it was when cast, keeping it close to the top end, and measure shrinkage with a tapered scale graduated to 1-100 in. You will note that the bar being 15 in. long is 1-5 of the total length longer than one ft. To get the shrinkage per foot we deduct 1-5 from the shrinkage shown on the scale. This I found from actual measurements to be .02 higher than what apears in the casting, so that we consider .12 shrinkage to be .10 in the casting and therefore normal for general work. After measuring shrinkage the bar is broken on a Riehle machine, giving transverse strength and deflection; then one-half is turned and threaded according to standard specifications and tested for tensile strength in an Olsen machine. The other half is clamped on end in a jig and drilled in the clean broken section for the chemical analysis. Thus you see from the ore bar we get shrinkage, chill, transverse strain, deflection, tensile strength and chemical analysis.

You will note from the samples of broken bars here shown the fine, clean, even fracture of the bars and also how solid they are—a result which I attribute to the dry sand core. You will find that there are no signs of shot in the bars caused by metal falling on to the iron yoke. We have never had any trouble from this source all the time we have been using them. The only trouble we have ever had has been by pouring them when the iron would hardly come out of the ladle. Then there would be small holes in the bar. It is really surprising how cold the iron can be and yet produce a solid bar. We rub a little dry plumbago on the yoke where the metal strikes it, just enough to give a polish. The core, being made with a piece of ¼-in. cold rolled steel bar just twisted out and not rapped at all, is perfect as to size and no blacking is used to make it skin well because that would alter the size. The cost of these cores is small; a boy can run six an hour very easily.

By the use of these bars we are gradually accumulating some very valuable information which of course will be of use to us in the future, but it would be far better if other foundries in this district would adopt this bar and collect data to compare with ours so that we could establish standards of excellence based on accurate tests taken from our own actual practice.

*Read at the monthly meeting of the Pittsburg Foundrymen's Association, Nov. 7.

Expenditures for the coming year by the Duluth, Missabe & Northern road will cover the purchase of 800 new steel ore cars of the same general type as those now in use, six new engines of the same motive power as those bought last year and the doubling of the capacity of dock No. 3 in the West End, Duluth. The ore dock extension means that the dock will be 1,150 ft. longer than now, making a total length of nearly 2,500 ft., and to the 192 pockets a like number will be added, making 384 pockets. This improvement will cost in the neighborhood of $300,000. The Duluth & Iron Range road has made an appropriation for the rebuilding of its dock No. 3 at Two Harbors, and for the purchase of four new engines and 300 ore cars.

B. H. Madison, San Francisco, Cal., who recently purchased the shipbuilding plant of Hay & Wright, has sold the plant to the Pacific Ship Yard and Ways Co., which has also bought the plant of the Marine Railway & Ways Co., merging the two properties into one. The directors of the combined companies are: B. H. Madison, president; James Tyson, vice president; and Joseph Hutchinson, George E. Billings and H. B. Madison.

The Anderson, Ind., tin plate works of the American Sheet & Tin Plate Co. continue idle, although it is probable that they will be placed in operation in December. Extensive repairs have been made at the plant, the cold rolls having been changed to tandem style and the tin house pots having been changed so that coal can be burned instead of natural gas. The failure of the natural gas supply in this region and the increased cost of operating with coal is largely responsible for the continued idleness of the mill.

New England Foundrymen's Association

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, on Wednesday, Nov. 9, B. M. Shaw, president, presiding. Applications for membership were received from the Athol Machine Co., Athol, Mass., and the National Steel Foundry Co., New Haven, Conn., and they were elected to membership.

John Magee, W. B. Snow and A. L. Lovejoy, the committee to prepare an expression on the death of Mr. Archer Brown, of New York, presented the following, which was unanimously adopted:

"The sudden and untimely death of Archer Brown has removed from our midst a much beloved friend and fellow member, whose genial disposition, courteous manner and hearty fellowship endeared him to all with whom he came in contact.

"We, the New England Foundrymen's Association, in convention assembled, express our deep regrets and record our high appreciation of the sterling qualities of his character and his unusual efficiency in his chosen line of business, which made and retained for him so many friends, endearing him to us and leaving with us pleasant memories of his life.

"In his death this association has sustained the loss of a valuable friend and its members individually an associate whose friendship was prized among the choicest of their business acquaintances.

"We extend to his family our deepest sympathy in their great affliction and our condolence in this their season of grief.

"It is ordered that these resolutions be spread upon the official minutes of this association and that a copy be sent to the widow of our departed friend."

The president then introduced Herbert E. Field, of Pittsburg, who addressed the meeting on the "Chemistry of Cast Iron." At the conclusion of the address the meeting adjourned to dinner.

An announcement was made at the evening session that the executive committee had decided to extend an invitation to the Philadelphia and Pittsburg associations to join with this association in its annual meeting, full particulars of which will be given later.

The speaker of the evening, Dr. Richard Moldenke, secretary of the American Foundrymen's Association, was then introduced and gave a very interesting address on "Chemistry in the Foundry."

Following the address a rising vote of thanks was extended to the speakers. This was made unanimous. The following were in attendance:

Dr. Richard Moldenke, Watchung, N. J.
Herbert E. Field, Pittsburg, Pa.
Geo. B. Buckingham, Arcade Malleable Iron Co.
Wm. H. Bense, Kinsley Iron & Machine Co.
C. A. G. Winther, Chapman Valve Mfg. Co.
C. L. Newcomb, Deane Steam Pump Co.
D. E. Maxfield, B. F. Sturtevant Co.
W. B. Snow, B. F. Sturtevant Co.
J. P. Barstow, Barstow Stove Co.
S. G. H. Fitch, Vaughn Machine Co.
T. W. Fry, Sullivan Machinery Co.
John Magee, Magee Furnace Co.
Fred F. Stockwell, Barbour-Stockwell Co.
R. H. Penny, Barbour-Stockwell Co.
T. C. Wilson, Barbour-Stockwell Co.
Geo. H. Gibby, Gibby Foundry Co.
W. H. Stafford, Gibby Foundry Co.
Henry Souther, H. Souther Engineering Co.
J. G. Aldrich, Providence, R. I.
A. W. Walker, Walker-Pratt Mfg. Co.
B. M. Shaw, Walker-Pratt Mfg. Co.
J. O. Henshaw, N. S. Bartlett & Co.
W. M. Saunders, Saunders & Franklin, Chemists.
Fred W. Dixon, Taunton Locomotive Mfg. Co.
Z. R. Tucker, Brown & Sharpe Mfg. Co.
G. H. Carson, Mechanics Iron Foundry.
H. E. Gibby, Mechanics Iron Foundry.
C. C. Boyden, Matthew Addy & Co.
W. J. Sprague, B. F. Sturtevant Co.
Geo. H. Lincoln, G. H. Lincoln & Co.
W. H. Coffin, Springfield Facing Co.
L. N. Perrault, B. F. Sturtevant Co.
A. J. Miller, Whitehead Bros. Co.
D. F. Eagan, Pridmore Moulding Machine Co.
J. M. Darke, General Electric Co.
Geo. O. Sawyer, Hartford Laboratory Co.
C. Hitch, Jr., American Tool & Machine Co.
Theo. H. Colvin, Colvin Foundry Co.

The papers read at the meeting are given below:

CHEMISTRY OF CAST IRON.

BY HERBERT E. FIELD.

Chemistry has slowly but surely gained a foothold in our foundries. A new branch of foundry practice has been created and foundry chemistry has now a recognized place and name. Starting with a few facts experimenters have built up a branch of the iron industry called the chemistry of cast iron. I say "built up;" I should say built down. When we construct a building we make sure that our foundations are solid. The superstructure will then stand the test of time. The chemistry of cast iron has been built without foundations; it has been a building down rather than a building up. We have gone from results to causes instead of from causes to results. We have observed that cast iron possessed certain properties and have gone back in a heterogeneous manner to find out what caused it to have these characteristics.

The study of cast iron continually brings up the query, Why? Silicon softens iron. Why? Sulphur hardens iron. Why? Phosphorus makes iron fluid. Why? Manganese makes iron hard or soft. Why? Graphitic carbon makes iron soft, and combined carbon makes it hard. Why? I shall not attempt to answer all of these questions in this paper, but will try to bring to your attention in a general way the causes of those reactions which make cast iron so valuable a product. A knowledge of these fundamental principles will greatly aid in building up a permanent science which should prove to be of as much value to the iron founder as has been the metallurgy of steel to the steel maker. The chemistry of iron has not kept pace with the chemistry of steel, due to the fact that this work has had comparatively little attention, while some of the brainiest men of the times have given years to solving the problems in connection with the metallurgy of steel.

In dealing with my subject I shall as far as possible eliminate technical terms and shall use such illustrations as will appeal to the practical foundryman. The paper is not prepared for a scientific body but to give a simple explanation of the reactions which form the basis of foundry chemistry.

Composition of Cast Iron.

Cast iron is made up of from 88 to 96 percent of iron. Iron is what is known in chemistry as an element. An element is a substance which cannot by any known means be changed to a substance which has a different set of properties. We may melt iron; we may subject it to the highest heat of the electric furnace; we can change its form, but not its nature. It is still iron. Wrought iron is the nearest to pure iron of any of the commercial iron products. It is iron mixed with very small amounts of other substances. Steel ranks next and contains from .1 to 1.25 carbon and small amounts of other impurities depending upon the kind of steel. Cast iron contains a very much larger proportion of impurities than either of the above. In fact, those properties of cast iron which make it valuable as a cast product are due to these other substances which will henceforth be referred to as impurities. Carbon, silicon, sulphur, phosphorus and manganese are the impurities which play the most important part in determining the different kinds and grades of cast iron.

Carbon the Controlling Element.

Carbon is the controlling element in cast iron. Without carbon cast iron would be practically useless. Carbon controls its strength, its shrinkage, its softness and to some extent its fluidity. Why does it perform these valuable functions?

Let us study for a moment the nature of cast iron. What is it? We have said that it was iron containing several impurities. We have come to use the term "contained" because

it is indefinite and covers up a lack of knowledge of the true condition of these elements in cast iron. There is a difference of opinion in regard to the condition and action of some of the impurities in cast iron. There can, however, be but little question in regard to carbon.

The carbon in molten cast iron is really dissolved in or dissolved with the iron. In order to better understand the reactions which take place in iron we will consider a simple example with which we are all familiar, viz., a solution of salt in water. It we dissolve one part of salt in 10 parts of water and then cool the same to a temperature of about 17 degrees Fahr. some of the water will crystallize, or, as we say, freeze out, in the form of pure ice, free from salt. The salt will be left in a solution with the remaining water. If, however, we dissolve one part of salt with four parts of water and cool the same to about 10 degrees Fahr., we will find that salt will crystallize out as pure salt instead of the water freezing out, as in the first instance. In other words, when we cool a solution of salt with water if there is an excess of water present a part of the water will separate out on cooling. If there is an excess of salt present, a part of the salt will separate out on cooling. Let us apply this to cast iron and call it a solution of carbon in iron. We will then readily understand the reactions which takes place when carbon dissolves in and separates out of iron. If we start this with some pure iron free from carbon and pack it in a crucible with carbon and heat it to a high temperature, even before the iron melts it will begin to absorb the carbon. (This is the well known cementation process of making steel during which the hot iron absorbs the carbon while both are in a solid condition.) If we continue to heat this iron until it melts it will absorb carbon until when heated to the highest temperature it will dissolve approximately 6 percent. If we cool this hot solution of carbon and iron we will find that as the iron cools the carbon will separate out just as the salt did in the cooling of our salt solution. As the temperature increases the iron dissolves more carbon. When the temperature decreases this carbon will be thrown out of solution. For example, if we found upon heating the iron to a maximum temperature it would absorb 6 percent of carbon, and that when heated to 100 degrees less it would absorb but 5 percent of carbon, then when we cooled our solution down through this 100 degrees 1 percent carbon must separate out, leaving but 5 percent in solution.

Let us use another homely illustration of this point. If we add salt to water the salt will dissolve up to a certain amount. If we continue to add salt beyond this amount it will remain in suspension in the water. When the water has dissolved all the salt it will, we say it is a saturated solution of salt and cold water. If the water is heated, it will dissolve more salt. There is a point, however, where no more salt will dissolve even upon further heating. This would be a saturated solution of salt and water. If we cool this hot solution the extra salt which dissolved upon heating will separate out, but will leave in solution in the water enough salt to saturate it at the temperature to which it is cooled. The more rapidly the hot saturated solution is cooled the finer will be the particles of salt which will separate out. If, on the contrary, the solution is cooled slowly, the salt will crystallize out in large crystals. In comparing this solution of salt with our crucible of carbon and iron we draw the following lessons: The carbon dissolved in the iron as did the salt in the water. There was a point where the iron would dissolve no more carbon, just as there was a point where the water would dissolve no more salt. When we cooled the salt solution, salt separated out, leaving the water saturated with salt at the temperature to which it was cooled. When we cooled the carbon solution in iron, carbon separated out, forming what we know as graphitic carbon and leaving the iron saturated with what we know as combined carbon at the temperature to which it is cooled. That the graphite separates out from the iron at the instant the iron begins to cool is very noticeable in blast furnace practice. Those of you who have seen such a furnace in operation will remember the kish which flies from the iron as it comes from the furnace. This is a form of carbon which separates out from the iron as it cools, due to the fact that in cooling the iron loses its ability to hold the carbon in solution and hence the carbon is thrown off.

Cast iron is, then, a solution of carbon in iron. When the iron cools the carbon separates out of solution. The slower the iron cools the more complete will be this separation, and the larger will be the particles of the separated carbon.

I have endeavored to show in the foregoing illustration, first, that there is nothing mysterious or mystical about cast iron, and second, that it follows the rules and laws that govern the simplest changes in every-day life.

Characteristics Which Make Iron Valuable.

The chief characteristics which make iron valuable are its softness, its fluidity and its low shrinkage. These three properties are dependent upon the above consideration of the solution of the carbon and iron.

Softness.—You have been repeatedly told in stereotyped phrases that combined carbon hardens iron and that graphitic carbon softens iron. The formation of graphitic carbon, as explained in the early part of the paper, was based on the supposition that the iron contained no silicon. In considering the reason for the softness of cast iron we must take this important impurity into consideration. Graphitic carbon is formed by a separation of carbon from the iron as it cools, due to the fact that the iron can hold only so much carbon in solution at a certain temperature and that when the iron is cold it can hold but a comparatively small amount in combination. By introducing the element silicon we find that the same softness in cast iron can be produced with lower carbon. This is due to the fact that iron which contains silicon will hold less carbon in solution. Consequently two irons which contain the same carbon and different silicon will vary in softness. The iron which contains the most silicon will have more of its carbon in the graphitic state. Pure iron will hold in solution in the solid state about one percent of carbon. This is the so-called combined carbon which hardens iron. Irons containing silicon will hold less carbon in the combined state and in this manner silicon acts as an important factor in softening iron.

Graphitic carbon softens iron first because it serves to destroy the continuity of the iron, making it less dense and easier to penetrate, and second, because it acts as a lubricant to the tool which is used for cutting it.

Fluidity.—Fluidity of cast iron refers to the length of time that the iron will remain liquid. The fluidity of a substance is to a large extent a question of temperature. The prolongation of this fluidity is a question of composition. Cast steel melts at a higher temperature, is cast at a higher temperature and its initial fluidity is greater than that of cast iron. It will not, however, run long thin strips nor retain its fluidity in the ladle as long as will cast iron. Cast steel contains comparatively little carbon; cast iron contains a large amount of carbon. If we examine the action of carbon we will find the reason for this prolongation of fluidity.

The mixing of salt and ice together to produce cold is too familiar to need explanation. If combined in correct proportions the temperature of the mixture may be reduced 70 deg. F. This is due to the fact that in the solution of ice and salt, solids are changed to liquids. Heat is required to bring about this change and this heat will be absorbed from the surrounding substances. The heat thus taken up is sufficient to reduce the temperature of the mass 70 deg. and when the ice and salt are separated from solution the same amount of heat will be given up as was absorbed in the solution. The heat necessary to a change of this kind is called latent heat. We are more familiar with it in the case of steam. It is the heat which must be applied to water at the boiling point in order to

change it to steam. It, however, produces no rise in temperature. When the steam changes back to water again this same amount of heat is liberated. Let us apply this to cast iron. When carbon dissolves in iron latent heat must be supplied to the carbon to change its condition. Heat must be furnished to melt iron and for every unit of heat applied there is a corresponding rise in the temperature of the iron. The latent heat which is used up in changing the solid carbon into dissolved carbon causes no rise in temperature. It is the same heat absorbed in the ice salt solution and in the change of water to steam.

All molten cast iron contains carbon in solution. Heat has been rendered latent in dissolving this carbon and heat must be given up when this carbon separates from solution. As cast iron cools its ability to hold carbon in solution decreases and the carbon separates out. As it separates out the heat which was rendered latent by its solution is given up. This will account for the fluidity of cast iron. In the first place iron will live longer in the ladle than will steel, due to the fact that the carbon gradually separates out as the iron cools and gives up its latent heat, which prolongs the cooling of the iron. The more important action, however, takes place during casting. When the iron comes in contact with the sides of the mold, the latter takes heat from the iron, thus lowering its temperature. At the moment the temperature is lowered carbon separates out of the iron, and in separating out gives up heat. This heat prolongs the fluidity of the iron just at the instant when it requires this fluidity to fill the smallest corners of the mold.

Shrinkage.—Shrinkage and lack of shrinkage in cast iron are accounted for by the relation of carbon to iron. Cast steel contains a comparatively small amount of carbon; cast iron contains carbon up to 4 percent. The chief difference in their composition is in the amount of carbon and silicon they contain. Cast steel shrinks much more than cast iron. Inasmuch as the chief difference in composition is a difference in the carbon and silicon present, we can safely consider that the variation in shrinkage must be due to this cause. In comparing the casting of cast iron and cast steel we will readily see how the carbon accounts for this difference in shrinkage.

As the molten steel comes in contact with the mold it solidifies, forming a shell the shape of the mold. This shell will rapidly grow thicker as the steel cools. But inasmuch as the steel in a hot molten state occupies more space than it does in a cold solid state, there would be left in the inside of the casting a cavity the size of which would be equal to the difference between the volume of the molten steel and the volume of the cold steel. This is not exactly correct, however, as the contraction which sets in as soon as the shell forms on the outside of the casting somewhat reduces this internal shrinkage. The structure of the steel from the center to the outside is fairly uniform and we will readily note that no chemical change other than the change from the liquid to the solid state has taken place.

Cast iron acts in a similar manner when poured into a mold. The iron sets, taking the conform of the mold. This shell increases in thickness as the iron cools, but in place of the uniform product noted in steel we will have a mixture of graphitic carbon and iron due to the separation of the graphitic carbon from the iron in cooling. The specific gravity of cast iron decreases as the percentage of graphitic carbon increases, or, in other words, the weight of a unit volume of cast iron will be less as the percentage of graphitic carbon increases. Conversely, then, a unit weight of cast iron will occupy more space as the percentage of free carbon increases. The slower the cast iron cools the greater will be the proportion of carbon separating out as graphitic carbon. The rate of cooling depends upon the rapidity with which the surrounding mold will conduct away the heat. After the iron is cast into the mold the mold will gradually heat up and the hotter it gets the more slowly will it conduct away the heat from the casting. The shell formed on the casting helps to keep the inside of the casting hot and it will therefore cool more and more slowly as it cools from the outside toward the center. Consequently more and more carbon will be found in the graphitic condition as we near the center. We find, therefore, that the graphite separating out in the center of the casting takes up more room than would the iron without the graphite and thus tends to fill up the hole which would otherwise have been formed in the cooling of the iron, as was noted in the steel illustration.

Silicon aids in reducing shrinkage by its action in forcing graphitic carbon out of solution. Its effect is therefore indirect. An excess of silicon over the amount necessary to force the desired amount of carbon out of solution would tend to increase rather than to decrease the shrinkage.

Conclusion.

We have noted that cast iron in the liquid state may be called a solution of carbon in iron; that in the solid state soft cast iron may be considered as a mixture of graphitic carbon and iron; the transition from the dissolved carbon to the graphitic carbon accounts for the utility of cast iron. The graphitic carbon itself gives softness to the iron, the latent heat given off by the separation of the carbon gives fluidity to the iron, the expansion due to the separation of the carbon as graphite gives low shrinkage.

In considering carbon as the most important element in controlling the properties of cast iron, I do not wish to be understood as belittling the effects of silicon, phosphorus, sulphur or manganese. These elements have pronounced and important effects on cast iron, but their action is largely an indirect one. The carbon is the medium through which they act.

CHEMISTRY IN THE FOUNDRY.

BY DR. R. MOLDENKE.

In discussing this rather broad subject before an association of practical foundrymen, it would seem best to take it up from the standpoint of what immediate good it will do each member interested. The foundry owner must be convinced that the use of chemical knowledge in his establishment will bring him direct returns, before he feels called upon to change existing conditions and to add another department. Furthermore, once the founder is convinced that it is a commercially wise procedure to work on more rational and scientific lines, he will weigh very carefully the temperament and progressiveness of his shop management so that a radical departure of this kind will not disrupt his organization, and leave him temporarily worse off than before.

With the stuff our modern foundry foremen and superintendents are made of there is little danger of opposition to advanced methods, for the eagerness with which the rank and file of the shop has taken hold of the chemistry of iron is in itself a sharp rebuke to the great majority of foundry owners who profit by the progress made but are careful not to contribute financially to the further advance of foundry science.

Granted that the careful foundry proprietor, who reads his trade journals regularly and has thus learned that the foundry advance has come to stay, finds that his employes are just as much interested as himself, it remains to see how he will apply the chemistry of foundry materials and processes to the best advantage. This will be the purpose of what is to follow.

It is a mistake to think that the first thing wanted is a laboratory and an analyst to dissect everything bought and made, regardless of conditions. This mistake has always brought with it unpleasant consequences and has really retarded progress rather than advanced it. I remember buying a complete laboratory for my own works from a competitor further West, who had put it in, hardly used it, and then sold it in disgust. When I first was so fortunate as to get an opportunity to study the chemistry of iron, the far-thinking president of the large establishment introduced me as a new clerk. My time was partly spent in routine work, such as keeping

records, but I was instructed to keep my eyes open and absorb foundry knowledge. In this way none of the practical hands of the works suspected the radical changes that were to follow. I can truly say I did not myself. The desirability of rearranging the thousands of blue prints which were in constant use at the foundry in question came up, and then it was discovered that I was a draftsman. A little matter of the proper size of pipe for supplying a forge shop with the necessary steam for power developed the fact that I was an engineer. In the meantime some tests on the composition of the bad material of our business rivals required the fixing up of a small room with shelves, water supply, gas, and some chemicals and apparatus. Then it dawned upon the troubled shop management that I was a chemist. In the meantime the complete redesigning of the power plant, the introduction of electric light and power, and special problems in the direct manufacture of the specialties we sold, had gained me the confidence of all the fair and open-minded men in the place, so that when it finally turned out that I was there for standardizing the process and shop methods, every one was ready to help me do it. It was then that I became a metallurgist. I owe it not so much to ability, but to the forethought of my employer, who avoided the open, or still worse, secret opposition of the men who were to be benefited while being controlled, by keeping them in the dark until the work spoke for itself. I owe it to the men themselves who afterwards went out of their way to report to me every peculiarity of behavior of the metal in cupola and furnace, wishing themselves to learn the explanation and in reality teaching it to me, as the trained investigator can quickly grasp the facts of the case and what they are apt to lead to.

While in the early days of foundry progress along scientific lines, this way of getting started was essential to get results that paid, and it is not now so difficult or costly to get the iron end of a foundry on correct lines, yet it is still wise not to go too fast, but to use the cheapest means to the end until the progress made warrants the addition of a complete laboratory department.

The very first place that the chemistry of iron can be made to pay in a foundry is in purchasing the pig iron. The revolution in this respect that our early investigators, and more especially the American Foundrymen's Association, have brought about is hardly conceivable, so far-reaching in its effects has it been. Today over three-fourths of the iron bought is on chemical specification. I am in constant receipt of inquiries from foundries and pig iron brokers alike relative to the specifications for foundry pig iron recently advanced by the American Society for Testing Materials, and since amended at the request of the foundrymen to cover their wants more fully.

Here the foundryman, once he knows what he needs for his work, can specify the analysis required, and is certain of getting a more uniform material than ever he could when iron was judged by its fracture. The variation allowed the furnace before the shipment becomes subject to penalties, or even rejection, is such that a careful spreading of each carload on the last one of the same approximate composition, and drawing from the end of the pile, will give such uniform charges, that with a good melter at the cupola, no anxiety need be had about the metal tapped out daily.

Contrast this with the old way when worry was written all over the faces of the foundry officials from the making up of the charge until the shaking out of the first castings before going home. I have myself seen twelve different brands of pig iron put into a mixture in small quantities, in order to avoid chances of variation due to a disagreement of the fracture appearance with the actual facts. On the other hand, I have run month in and month out on one single brand of iron piled up in my yard in four lots with the silicon ranging from 1.75 to 2.50 and never was bothered with complaints from the machine shop or customers.

This may be said to be the first benefit of the chemistry of iron to the founder, and he needs no laboratory for this on his own place, but simply a consultation with some one who knows what he requires in the first place, next careful sampling by a bright foreman or assistant, and then a commercial analysis.

I would therefore urge every one present to get him a copy of the standard specifications for foundry pig iron, and study them with a view of his next ordering.

For coke the matter is not quite so far as yet. We all know that too much sulphur is detrimental. We also know that it is not the appearance or the name of a coke that makes its good melting qualities. Even the tough looking by-product article is now recognized as first class, if it is of the proper composition, and the burden of the cupola be arranged to suit its structure. A committee is at the present time being formed to study the question of a standard foundry coke, issue specifications for the purchase of this standard with penalty and bonus for variations therefrom. So in a short time this issue will be dealt with and bring much good to the foundryman.

As it is, you can specify and buy your coke with the sulphur down to 1.00 percent, provided they will give it to you, and with a good coke or anthracite, and uniform iron, your charge on the cupola platform is as good as can be made; being the practical application of science directly where it pays well, and all this with a cost of but a few cents a ton added to the iron tapped at the cupola spout. As a simple matter of insurance this added expense should be granted by every foundryman, for it saves many a dollar otherwise wasted and lost usually at a time when he can least afford it.

I mentioned before that once a founder knows what he needs in the way of compositions of his irons, he can make his mixtures from the analyses of the irons he buys, and thus keep himself out of trouble. To do this properly he must understand a little of the chemistry of his melting process, so that he can allow for the changes in composition brought about by it in his charges and it presupposes that he knows the composition of every portion of the iron going in. This means specifically the pig iron and the scrap. The latter is the less certain element of the calculation. If the founder takes only his own scrap, he might get along with an occasional analysis of this, so as to get the proper factor for his mixture calculation. But when he buys a lot of outside material to add to his own sprues and gates, the problem becomes a little more complicated, but requires only repeated determinations of the silicon and sulphur of his daily product, so that this uncertainty may be removed. It is here where it will pay a large works to have a laboratory.

When we come to the specialties, such as car wheels, chilled rolls, malleable, and the like, a correct and safe procedure can only be had by daily analysis of practically every heat, at least for the silicon. This gives the key to the succeeding mixtures at hand, and the run of successful heats should be practically unbroken. I have had no difficulty in taking off a thousand heats at a stretch without making any bad iron at that time. In fact, it became only a matter of furnace repairs which were reluctantly made when the iron showed signs of suffering from being compelled to remain in the bath too long for its subsequent good behavior.

I have purposely refrained from going into the effect of greater or less quantities of the constituent elements of cast iron on that material, for this has been ventilated freely by able metallurgists. It seems fitting to say, however, that with the knowledge we have at the present day, the safe limits within which we can turn out our daily work have been widened considerably. The correlation of silicon and sulphur can be used in a way that many a brand of iron habitually high in the latter element may find its way into a mixture, properly counterbalanced with silicon, and successful castings made. The proper use of steel scrap in fairly large quantities for the purpose of reducing the total carbon of the metal, and

thereby making it stronger, is a direct result of our knowledge of the chemistry of iron. If now we could only add an alloy to such a melt which would have a similar effect on it, as does ferromanganese on steel from the converter, a great stride ahead would have been made. I confidently predict that a fortune awaits the man who brings out this material which would render the art of casting high grade metal still more certain than it is today. Indeed, I may say that it would enable us to use irons in both the cupola and the furnace which today are put into sash weights. There are problems in the chemistry of iron ahead of both blast furnaceman and foundryman which we are bound to meet in the next fifty years, for the rich and pure ores now available will be exhausted eventually, and the poorer and more impure ones will have to take their place. If at that time the foundryman is in position to take a high sulphur pig iron, and desulphurize it in the cupola practice; if he can take a heavy percentage of burnt grate bars or other similar scrap, and still turn out high class castings, then he may consider himself as not fallen behind in the procession.

The growing favor with which the air furnace is being looked upon for regular foundry work is also bound to help the industry. The additional cost of the process is easily counterbalanced by the superior work turned out. One large establishment is beginning to make all its engine castings in this way, and I know of many places where the substitution of furnace iron for the cupola product would mean longer life for castings which must be made out of cast iron to be used at all. Founders might therefore give this matter some attention in the near future. It means improving their product in that it keeps the metal from contact with the solid fuel, means less sulphur, less total carbon, greater uniformity in the metal, in fact all the advantages which gun iron has over the ordinary run of cupola work.

We Americans are said to appropriate every good idea we find on the other side of the water, and so we have taken Prof. Turner's discovery of the action of silicon on the carbon in cast iron. We have taken Prof. Ledebur's studies of the condition of the carbon in the malleable casting, and have pushed these inquiries far ahead in connection with our daily work. It is gratifying to see that now England and Germany are awakening to the importance of the chemistry of cast iron, and foundrymen's associations are being called to life whose primary object is to study advanced methods of working. We wish them all possible success, and hope that their transactions may contain much new material that we can appropriate and apply later on. A rivalry which means the freest interchange of information is a detriment to no one, and stimulates research as well as commercial enterprise. May we learn much more of the chemistry of iron in our foundry practice, and gradually clear away the doubtful portions which still remain to let us feel how little we really do know.

The fiscal year of the Sloss-Sheffield Steel & Iron Co. will close Nov. 30 and according to officials of the company, the report which will be submitted next April to the stockholders will be a most favorable one notwithstanding setbacks which took place during the year. The production of pig iron during the year ending Nov. 30, 1903, amounted to 311,093 tons. For the year ending Nov. 30, 1904, it is believed the annual production will be nearly 375,000.

The Avery Stamping Co., of Cleveland, has acquired the property of the West Virginia Steel Co., Wheeling, W. Va., formerly Caldwell & Peterson, and has removed the plant to Bellaire, O., where an abandoned glass plant has been purchased and the stamping machinery installed. The plant will be operated under the firm name of the Avery-Caldwell Mfg. Co. Charles J. Colling, formerly superintendent of the Cleveland Wire Spring Co., will manage the plant.

THE BRISTOL CO.'S EXHIBIT.

The display of recording instruments for pressure, temperature and electricity made by the Bristol Co., of Waterbury, Conn., is located in the electricity building. The illustration shows the appearance of the booth which is 22 ft. long by 12 ft. wide. The booth contains a large variety of instruments which record continuously with ink upon graduated revolving charts all changes in pressure, temperature or electricity, so that a 24-hour period may be observed at a glance. Many of these instruments are in actual operation and may be inspected by visitors to show the construction and scientific principles upon which their operation depends, and the extreme sensitiveness and accuracy obtainable in devices of this character without rendering them too delicate for commercial application. Recording presure gauges are shown for ranges from full vacuum to 10,000 lb. per square inch, and recording thermometers and pyrometers for ranges from 60 degrees below zero to 1,200 degrees Fah. The recording thermometers are made in many forms applicable to all industrial requirements, especially where it is desired to record temperatures at a distance from the source of heat. Recording volt, ampere and

A WORLD'S FAIR EXHIBIT.

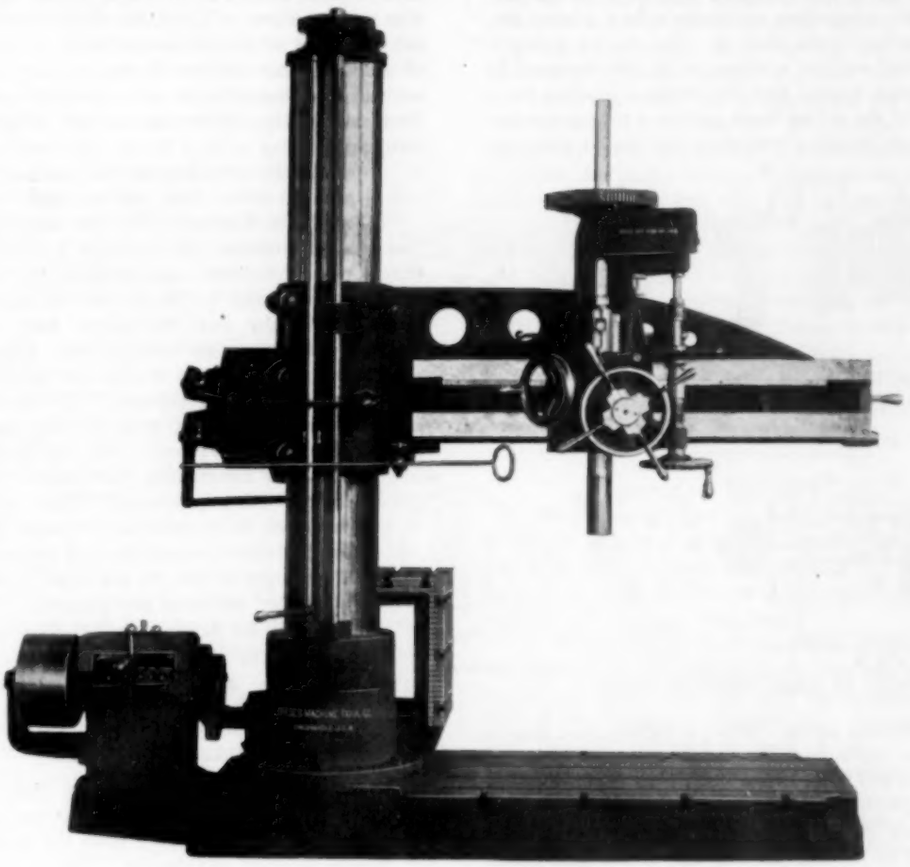
watt meters for both alternating and direct current are shown, including a great variety of ranges suited to commercial demands for different voltage and current in electric light, power and railway plants.

Recording water level gauges are seen in operation and also an instrument designated as a thermometer-thermostat. This last instrument is so constructed that it may be used to give an alarm or set in operation temperature regulating apparatus at any predetermined point of temperature. This was described and illustrated in *The Iron Trade Review* of June 2, 1904. A full line of Bristol patent steel belt lacing is also exhibited and includes styles and sizes for all varieties and thicknesses of belting.

H. E. Hass, Beaver Dam, Wis., is arranging for the removal of his gas and gasoline engine shops from Beaver Dam to Fond-du-Lac, Wis. The removal is made on account of the excellent shipping facilities at Fond-du-Lac.

VARIABLE SPEED DEVICE.

The variable speed device recently patented by Henry Dreses is applied to the radial drill presses made by the Dreses Machine Tool Co., of Cincinnati. The speed variator on the 31, 36, 48 and 54-in. radials has six changes arranged in geometrical progression; these in combination with the back gears give twelve changes of spindle speed. The speed variator on the 60 and 72-in. radials has seven changes, making with the back gears a range of fourteen spindle speed changes. The device is operated by one lever, shown in front of the box at the left in the halftone reproduction, which illustrates the device as applied to a radial drill of the Dreses Machine Tool Co.'s manufacture. The gear changes are operated by a movement of the single lever and this is locked in place by a latch and plunger attachment. Connection for the various speeds cannot be made unless the parts are in proper position, this constituting a positive check against accident from thoughtless handling by the workman. The mechanism is positive and there are no friction clutches. In order to avoid the jar in changing from one speed to another, a device has been introduced by which the variable speed shaft and with it the whole machine runs at the slowest speed during the intervals in gear manipulation. The construction is not complicated, the gears are made from bar steel and those subjected to the greatest work are hardened. The change speed box is designed to permit a ready substitution of it for the ordinary cone pulley.



RADIAL DRILL PRESS WITH PATENT SPEED VARIATOR.

To go more thoroughly into the mechanism of the speed variator and the particular means by which the results already summarized are obtained, mention may be made in the first place of a frequent objection to the use of gearing for changing speeds. This is grounded upon the liability to strip off the teeth or do other damage when the speed is changed abruptly from a slow to a higher speed. The meeting of gears when the supporting shafts are at rest is a simple and safe procedure but the throwing of gears into action when one is at rest and the other turning rapidly is altogether another affair, as anyone with more or less back gear experience will admit. Figs. 1 to 5 inclusive show clearly how Mr. Dreses meets these difficulties.

Fig. 1 is a plan of the device with parts broken away and others in section. Fig. 2 is a front view and Fig. 3 is an end view. Fig. 4 shows the driving pulley as it would appear if a section was taken on line a-a of Fig. 1. Fig. 5 is a side view of the driven gear of the first set of gear wheels, being the slowest gear train, and as such a gear would appear if a section were taken on line b-b of Fig. 1.

The driving shaft is indicated at A and this receives motion from motor or belt in the usual way. A shaft at the other end of the device is coupled direct to the machine and between the two are sets of gear trains graduated in size for the different speeds. The two wheels of a set are engaged by an idler B which is adjustable across the faces of each pair and capable of engaging with any of them. This idler is mounted on a hand lever C, having at one end a bearing on a guide rod, and this in turn is supported on arms D pivoted to the main frame or housing of the speed variator. To attain quick action in speed changing, it is desirable that the new position should be found promptly and that in making the movement the lever and idler shall not be lifted any higher than is sufficient to clear the gears. The lever C rests on a ledge E and on the under side of the hand lever is a stop F which allows the idler to clear the gears during the horizontal shifting of the lever. It is equally important that there shall be sufficient lift of the lever and to ensure this there is a pin G sliding along the ledge during the intermediate positions on the hand lever and preventing the lowering of the idler into mesh until the pin arrives at any one of a number of openings in the ledge E and

it can then be lowered into engagement with the appropriate gear train. In this position the lever is locked by a bolt H. There are two projecting handles on the upper side of the lever to facilitate the lateral movement of the idler. A groove J in the ledge serves as a guide during the adjustment, the pin G sliding in the groove and is thus confined to move in a line above the points of the meshing contacts with the gears and when the pin is dropped it falls into the exact position intended for it.

A stationary idler K is continually in mesh with the slowest gear train. The adjustable idler is therefore not needed to operate this train and there is consequently no opening in front of this train of gears for the pin G. The largest gear is loosely mounted and has a recess in the side containing a ratchet wheel and the motion is transmitted by pawls L, as illustrated in Fig. 5. When any of the faster gear trains are thrown into operation the ratchet wheel moves ahead and away from the pawls, the latter slipping over the teeth. Another means of easing this momentary resistance is by a driving pulley attached by springs to the shaft A. The driving pulley is then loosely mounted and has a recess at the side occupied by a disc M. The space around this disc forms a housing for a spring. One end of the spring bears against a plug projecting from the disc M and the other rests against a similar plug projecting from the driving pulley. When a higher speed gear is suddenly thrown in, the momentary resistance is diffused over a part of the rotation and to an extent met by the compression of the spring. This yielding transition from one speed to another and the compression of the spring is limited by a curved rod N in the coils of the spring and the free end in due time comes in contact with the plugs and then the connection becomes positive until the spring again expands, as in Fig. 4. A third means of solving the problem is covered by the patent and is shown at the connection of the shaft from the gear box with the one from the radial. Transmission by gearing is had, as illustrated in Fig. 1, and one of the gears is rigidly mounted on its shaft. The other gear, O, is carried by a sleeve and the two are held by frictional pressure. The sleeve is shown in two halves with flanges projecting over the sides of the gear. Fibre or leather washers face the flanges and the frictional engagement is effected by a nut. All these expedients and others suggested are not essential, of course, in the one machine, but are covered by the patent as alternative designs for a yielding connection.

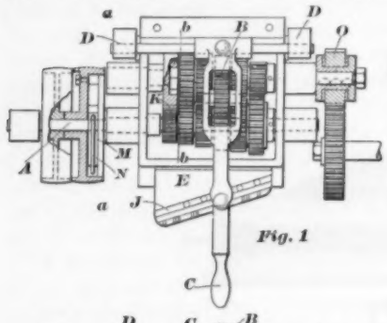


Fig. 1

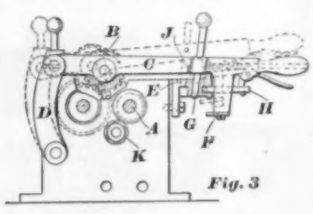


Fig. 3

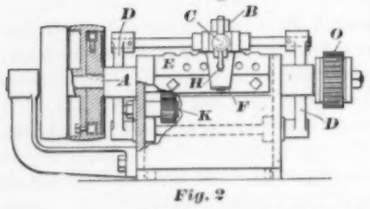


Fig. 2

Fig. 4

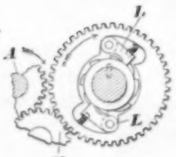


Fig. 5

THE IRON TRADE REVIEW

DETAILS OF SPEED CHANGING DEVICE.

The Pennsylvania Steel Co., Steelton, Pa., is rushing work on the idle furnace now being repaired and relined at North Lebanon, Pa., and the stack is expected to be ready to go into blast by Jan. 1.

PYROMETRY IN GREAT BRITAIN.

A list of British patents on pyrometers has been prepared by H. G. Graves for the Iron and Steel Institute. Mr. Graves has also a bibliography of the subject and briefly treats of the early stages in the development of heat measuring instruments. He says that one of the earliest occurrences of the word "thermometer" is in H. van Elten's "Recreation Mathematique," 1626. The word "pyrometer" is of even later origin, but it was in use by Peter van Musschenbroek in 1731, and, following him, by Desaguliers in 1734, to describe instruments they used for measuring the expansion of metal by heat. In 1754 Smeaton used the word in a similar fashion. There is not a very sharp line of demarcation between thermometry and pyrometry, and naturally endeavors were made at a very early date to measure high, as well as ordinary, temperatures. Perhaps one of the most interesting is divulged in a paper contributed anonymously to the Royal Society by Newton in 1701 This paper, written in Latin, describes a scale of temperatures and a method of determination based on the rate of cooling of a red-hot bar of iron freely exposed to the air. This method was followed up to some extent by others. About 1782 Wedgewood proposed his famous test, which depends on the shrinkage of clay as it is burnt. He was fully aware of the difficulties attendant on the method, but in 1785 was able to show how results, more or less uniform, might be obtained. For the early history of pyrometry, reference may be made to a classified bibliography of physical sciences given by Thomas Young as an appendix to his course of Lectures on Natural Philosophy and Mechanical Arts, which was published in two volumes in 1807. Before 1850, the patents taken out for devices for measuring temperature are few and far between. The earliest British patent appears to be No. 3206 of 1809, granted to Stephen Hooper, of Walworth, for "A thermometer or machine for ascertaining the heat of bakers' ovens, and various other purposes." This appliance might be described as a pyrometer, though it only depended on the relative expansion of a brass tube and a wooden rod, yet it was the precursor of numerous devices of similar character and purpose. The next recorded patent is for James Kewley's balanced mercurial thermometer in 1813. After 1850 patents became more numerous, and at the present time, the yearly average is over a dozen thermometers and pyrometers.

President French, of the Railway Steel Spring Co., reports that the bookings within the last two weeks have been larger in the aggregate than the total received within several months previously. The increase in the company's business, it is stated, promises to continue for some time. In addition to the steel springs sold by the company, which is its main line, the concern also does a considerable amount of repair work, which figures up to quite a substantial amount in the company's earnings. The initial dividend of 2 percent on the common stock was declared last April, and if the returns for the balance of this year come up to present indications it is likely that a similar dividend will be declared next year. The preferred stock is receiving dividends at the rate of 7 percent per annum. At the present time the company has an actual cash surplus of about $2,000,000.

In Hartford, Conn., Charles M. Joslyn, receiver of the Woodward & Rogers Co., manufacturer of machine tools, will pay the creditors a dividend of 51 percent on approved claims. The court complimented the receiver on having operated the concern at a profit.

PERSONAL.

W. D. Sargent, of New York, formerly president of the American Brake Shoe & Foundry Co., has been elected second vice president of the American Steel Foundries and will be in charge of manufacturing operations. Mr. Sargent has made a tour of the company's plants and some changes are to be introduced.

S. M. Cooper has been appointed general manager of the McKeesport (Pa.) plant of the American Sheet & Tin Plate Co., succeeding P. F. Smith, who resigned recently.

Edward Lavery, superintendent of the steel department of the McKeesport, Pa., plant of the American Sheet & Tin Plate Co., has been appointed to a similar position at the Vandergrift, Pa., plant of that company.

Henry C. Holthoff, organizer of the Holthoff Machinery Co., and vice president of the Power & Mining Machinery Co., Milwaukee, its successor, has resigned his office, to take effect Dec. 1. The Holthoff Machine Co. was organized several years ago by Mr. Holthoff, who has been connected actively with the business since. Upon the organization of the Power & Mining Machinery Co. Mr. Holthoff retained his interests and accepted the vice presidency. The plant is located at Cudahy, Wis.

Charles N. Gunn, who for many years had been at the head of the mining department of the Union Iron Works of San Francisco, has taken the general supervisorship of the Columbia Engineering Works. A. M. Clark, recently superintendent of the American Brake Shoe Co.'s steel plant at Chicago Heights, will have charge of the steel foundry of the Union Iron Works.

W. A. Nelson, who was appointed superintendent of equipment of the Allis-Chalmers Co., on Oct. 1, began his services with that company in August, immediately after his resignation became effective as assistant superintendent of the Westinghouse Electric & Mfg. Co. R. C. Wright, for several years in charge of the design of special tools and fixtures used in the manufacture of steam turbines at the East Pittsburg works of the Westinghouse Machine Co., has accepted a similar position at the Milwaukee works of the Allis-Chalmers Co. Charles F. Barth has recently been appointed foreman of the steam turbine department at the West Allis works.

E. S. Griffiths, secretary of the Cleveland Machine & Mfg. Co., sailed this week on the steamer Oceanic for a three months' visit in Wales and the Continent.

C. W. Jackson, general manager of the coke department of Rogers, Brown & Co., with headquarters at the Chicago office, will sever his connection with this company at the end of the year to enter into business for himself.

George C. Stevens, who was formerly connected with the Sharon Steel Co., has associated himself with W. G. Henderson, District Sales Agent of the Lackawanna Steel Co. at Cleveland.

The Girard, O., plant of the Carnegie Steel Co. has been closed for an indefinite period. Some time ago some of the mills were removed from this plant, but at present nothing further is being done towards dismantling. A strike has been on at this plant since August and the company secured an injunction against the strikers. Until the plant was closed no trouble was experienced in operating it. Most of the recent employes of the mill have gone to Youngstown where they have secured work in the plants in which strikes are now on.

The first annual meeting of the Farmers' Co-operative Harvesting Machinery Co. was held last week in the new plant at Springfield, O., which is nearing completion. The following directors were elected: O. E. Bradfute, Cedarville; John Begg, Columbus Grove; Louis Laybourn, W. N. Whireley, R. L. Holman, G. F. Jackson, J. L. Gilligan, Benjamin F. Howell and William N. Whiteley, Jr., all of Springfield.

ANALYSIS OF RAILROAD OPERATIONS.

A number of diagrams and tables are given in the *Sibley Journal* for November, dealing with the operation of railroads in the United States. The author, Sidney G. Koon, shows graphically the general tendency of recent years in connection with the haulage of the steam railroads. He finds that while the population has increased 13.7 percent from 1894 to 1901, the freight traffic based on the ton-mile unit has increased by 81.2 percent and the passenger traffic, based on the number of passengers carried, has increased only 5.4 percent. The increased power of locomotion and train speeds account for a continuous rise in ton-miles to 3¾ millions per year, an increase of 65 percent. The average value of the locomotives exported during the term of years in question was $9,250 and was presumably comparable with the figures for the average value of those in service, whereas the average earnings accounted for vary from $19,380 to $26,350 or from two to three times the value of the locomotives making the earnings. The diagrams show some rather curious features. The greatest augmentation in the weight of a train load began about 1898 and about that time, due to this cause, the earnings per train mile undergo a rapid change. The number of passengers fell off rapidly from 1894 to 1897, but this decline in proportion is no doubt due to the increased length of the average run. The diagrams show at any rate that the earnings per passenger have increased during the period 24.5 percent. Comparing the freight traffic with the population, the number of tons moved one mile has increased from 1,210 to 1,930 for each person, or 59.5 percent. The number of tons moved has increased from about ten for every member of the population to above fourteen and the earnings have shown a similar trend of movement. It would indicate the rapid fulfillment of population requirements by the railroads and the approaching adequacy of transportation facilities for internal commerce.

Obituary.

E. M. Fowler, retired lumberman and mine owner, whose fortune is estimated at $35,000,000, died Nov. 6 in Pasadena, Cal., after a brief illness. Mr. Fowler had extensive interests in iron mines on the Mesabi range. Recently he retired from business and went to Pasadena.

Joel Farist, president of the Farist Steel Co., died Saturday, Nov. 13, in Bridgeport, Conn. He had been in indifferent health for some time. He was the founder and was president of the Bridgeport Crucible Co. He was born in Sheffield, England, and was 72 years of age.

William Arthur Heywood, general manager of the Pennsylvania Iron Works, Philadelphia, who was well known in electrical and mechanical engineering circles in that city, Baltimore and Chicago, died at his home in Philadelphia, on Nov. 13, aged 38 years. Cerebro-spinal meningitis was the direct cause of his death. A native of England, Mr. Heywood removed to Philadelphia in 1885, and was made a division engineer of the old cable car service. In 1891 he went to Baltimore to take charge of the plant of the Baltimore Traction Co. He returned to Philadelphia three years ago, when he was appointed general manager of the Pennsylvania Iron Works. For several years he was a prominent member of the American Society of Mechanical Engineers. A widow and two sons survive him.

Joseph Joseph, for many years prominent in business and financial circles in Cincinnati, died last week at his home in Avondale, after an illness of two years. Mr. Joseph was born in Frankfort, Germany, in 1847, and had been a resident of Cincinnati since 1866. He was one of the largest operators in scrap iron, especially old railroad material, in the country. The firm of Joseph Joseph & Bro. was one of the best known scrap iron concerns in Cincinnati.

The Reierson Machinery Co., Portland, Ore., whose plant was destroyed by fire last September, is rebuilding on a larger scale and will be in much better shape to take care of its trade.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE PENTON PUBLISHING CO.

CLEVELAND, OHIO.

CHICAGO - - - - - - - - 1164 Monadnock Block.
PITTSBURG - - - - - - - - 429 Park Building.
NEW YORK - - - - - - - - - 150 Nassau St.

Subscription, $3.00 per annum. To Foreign Countries, $4.00. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

NOVEMBER 17, 1904

THE STEEL CASTING INDUSTRY.

Much has been written about the increasing use of steel castings in the last few years. What is well known as to the building of new works and the installation both of open-hearth furnaces and of small Bessemer converters tallies with the statistics of the American Iron and Steel Association, which show a marked increase in the production of steel castings since 1898, and more particularly since 1900. The view thus given of a steadily expanding industry has created an impression that a steel foundry is an attractive investment. The tendency naturally is, where attention is thus directed to an industry, for capital to rush in, on the idea that profits may be easily and quickly made. Thus it does not take long, under the American pace, to bring about the actual overdoing of an industry that but a short time previously showed demand quite outstripping the supply. Builders of machinery and of railroad equipment will readily recall the difficulties under which they labored in 1901 and 1902, and how work was often delayed for weeks by lack of the delivery of the small but very necessary tonnage of steel castings.

It is very difficult to estimate the resultant of the forces now at work in the steel casting industry. No one can say what is a normal demand, for there is the alternation of prosperity and slackness, while a progressive factor is the substitution of steel castings for gray iron and malleable castings and for forgings. Certainly the operators of steel foundries have had no doubt as to the excess of capacity in the past year. Two cents for castings that in good times were bringing more than double that price tells the story of keen competition; and it is known in a general way that the business has fallen off very considerably as compared even with the summer of 1903. The record of additions to plant, and the statistics of steel castings production in the past few years are interesting studies in this connection and throw some light on the question whether there is any call for new construction in this line. The 1898 Directory of the American Iron and Steel Association showed in that year 47 open-hearth plants prepared to turn out steel castings. In the Directory for 1901 this number was increased to 56. The Directory of the present year shows 84 open-hearth plants in which steel castings are made. Thus the increase in the number of plants has been more than 85 percent in the six years. The present Directory comments, also, on the marked increase in the number of Tropenas and other small converters installed in steel foundries. This is shown in the statistics of 1901 and 1904. In the former year there were reported 19 small and special converters in steel foundries, and in 1904, 28, of which 14 were Tropenas converters. In 1901 steel castings were made by 14 crucible plants, and in 1904 by 26.

The statistics of production in the past six years quite bear out the common impression as to the growing use of steel castings. In the table below we give a classified statement of production of various classes of castings by years from 1898 to 1903 inclusive, in gross tons.

PRODUCTION OF STEEL CASTINGS IN UNITED STATES—GROSS TONS.

	1898.	1899.	1900.	1901.	1902.	1903.
Acid open-hearth..	92,127	130,040	134,847	206,681	255,475	265,469
Basic open-hearth..	28,460	39,689	42,644	94,941	112,404	134,879
Bessemer	3,539	3,939	6,467	6,764	12,548	18,099
Crucible	4,235	5,500	5,989	3,927	4,955	5,409
Misc.	3,576	3,944	4,856	5,257	5,553	6,409
	131,937	181,112	192,803	317,570	390,935	430,265

It will be seen that the production of acid open-hearth castings has nearly trebled in the five-year interval, while that of basic open-hearth castings last year was nearly five times the total for 1898. Bessemer castings increased more than five-fold. The total of all classes of castings for 1903 was more than 3¼ times the total for 1898. Perhaps the noteworthy fact in the table is the increase in the basic open-hearth product, representing the widening range in choice of materials entering into steel castings.

The slackness of locomotive and car work in the past year acounts in large part, no doubt, for the poor showing of the steel castings industry in that period, as indicated by reports concerning actual operations of the steel foundries. Recently there has been a slight improvement, and this has been reflected by a very small advance in the price of certain castings. That the tendency from cast and wrought iron toward steel is to continue can hardly be doubted, in view of the attitude of engineers and of the associations of master car builders and master mechanics. The former has adopted as standard the cast steel draw bar, and malleable draw bars are rapidly disappearing in specifications. Bolsters and center plates for cars and steel wheel centers constitute an increasing tonnage in steel foundries. The adoption of the cast steel locomotive frame in place of the forged frame means five tons of steel castings for every locomotive, and locomotive contracts are calling more and more for frames of cast steel. Electrical work also affords an enlarging field for steel foundries. Rolling mills and steel works are adding every year to the tonnage of steel rolls, housings and other equipment that replace gray iron.

It is appreciated by those who have studied the condition of the industry in its recent development that the capacity for steel castings is now equal to any demand likely to be made in the near future. Just as the prosperity of recent years greatly stimulated the building of new blast furnace, steel works and rolling mill capacity, so, apparently, in the facilities for the manufacture of steel castings, new investors have gauged their operations not only to the then existing prosperity, but even to a demand somewhat in excess of the best records, and much new capacity was finished just after the country had seen the crest of the wave. The estimated capacity of steel foundries, according to figures in the last edition of the American Iron and Steel Association Directory, was 1,165,000 gross tons a year. These figures may be based in some instances on melting capacity rather than a close calculation of the facilities of the molding floor, but with all allowance on this score, it is apparent that there is leeway for a stout increase in demand over the high record production of 430,000 tons in 1903. One large jobbing interest alone, with its recent additions, is credited with a capacity of 280,500 tons of steel castings a year, or about two-thirds of the total production of last year.

Joseph Schonthal, Columbus, O., has recently purchased a tract of four acres on which there are several buildings, and is making extensive improvements to carry on the business of dealing in old material. The new equipment installed includes new shears and other machinery to enable him to put his material into more marketable shape. The property is situated on a railroad siding on which four of the leading trunk lines of the city enter free of charge, making his switching facilities the best in the city. Mr. Schonthal is also president of the Schonthal Iron & Steel Co., manufacturer of light steel rails, joints and spikes, which company has its plant at Cumberland, Md., and its offices at Columbus.

U. S. STEEL CORPORATION OUTPUT.

A feature of the report of the American Iron and Steel Association for 1903, as of that for 1902, is a statement of the production of ore, pig iron and various classes of finished material, by the United States Steel Corporation and a comparison with the total production of the country in each line. The figures below give the tonnage and percentage of the 1903 output and alongside are placed the percentages of the Steel Corporation for 1902 and 1901.

Iron Ore Shipments from Lake Superior and the Total Iron Ore Production in the Calendar Year 1903; also Coke Production in the Same Year.	By U. S. Steel Corporation	By Independent Companies	Total Shipments and Production	Percentage of U. S. Steel Corporation 1903	Percentage of U. S. Stee Corporation	
					1902	1901
Shipments of iron ore from the Lake Superior region in 1903.....gross tons	14,293,083	9,996,795	24,289,878	58.8	60.4	61.6
Total production of iron ore in 1903.....gross tons	*15,363,355	19,655,953	35,019,308	43.8	45.1	43.9
Production of coke.....net tons...	8,658,391	16,603,969	25,262,360	34.2	37.4	.....
Iron and Steel Actually Produced in the Calendar Year 1903. Gross Tons.	**Production U. S. Steel Corporation**	**Production Independent Companies**	**Total Production Gross Tons**	**Percentage U. S. Steel Corporation**		
Bessemer, basic, low-phosphorus, foundry, forge, and all other kinds of pig iron.	7,123,053	10,693,538	17,816,591	39.9	44.3	42.4
Spiegeleisen and ferro-manganese	156,188	36,473	192,661	81.0	81.0	65.4
Total pig iron, including spiegeleisen and ferro-manganese	7,279,241	10,730,011	18,009,252	40.4	44.7	42.9
Bessemer steel ingots and castings	6,191,660	2,401,169	8,592,829	72.0	73.9	70.2
Open-hearth steel ingots and castings	2,976,300	2,853,611	5,829,911	51.0	52.4	59.0
Total Bessemer and open-hearth steel ingots and castings	9,167,960	5,254,780	14,422,740	63.5	65.7	66.3
Bessemer steel rails	1,934,315	1,012,441	2,946,756	65.6	65.4	59.9
Structural shapes	660,978	434,835	1,095,813	60.3	57.9	62.2
Plates and sheets, including black plates for tinning	1,557 223	1,042,442	2,599,665	59.9	59.4	64.6
Wire rods	1,100,290	403,165	1,503,455	73.1	71.5	77.6
Bars, skelp, cut nails, open-hearth and iron rails, and other finished rolled products	1,510,085	3,551,923	5,062,008	29.8	31.1	27.3
Total of all finished rolled products	6,762,891	6,444,806	13,207,697	51.2	50.8	50.1
Wire nails.....kegs of 100 pounds	6,801,180	2,830,481	9,631,661	70 6	64.8	65.8

*Includes the total production of iron ore by the Pewabic mine, but does not include the production of the Biwabik and Mahoning mines for the account of the United States Steel Corporation.

Bollinger & Rieley, 42 and 44 Columbus street, Cleveland, recently incorporated as the Bollinger & Rieley Machine Co., have purchased the business and equipment of the Manning Machine Co., 100-110 Merwin street, Cleveland, and are making extensive changes at the Manning shops, so that the company will be in a position to triple its former output. The company has the following contracts under way: 100-ton refrigerating equipment for the Fishel Brewing Co.; 65-ton refrigerating equipment for the Forest City Brewing Co.; a water cooling plant for the J. D. Rockefeller building, and has just been awarded the contract for a 40-ton ice-making plant by the Telling Bros. Co., Cleveland. It has just completed putting in refrigerating equipment in the county morgue.

The Electric Controller & Supply Co., of Cleveland, has been awarded a gold medal for its World's Fair exhibit. The apparatus shown consists of a full line of the regular controllers for cranes, charging machines, and similar service—a working exhibit of a magnetic switch controller built for motors of any horsepower, magnetic friction and stop brakes, cushion type solenoids, electric lifting magnets for plates, billets, etc.; resistance banks, knife switches, and a working exhibit of the direct connected variable speed motor drive for planers which was described in *The Iron Trade Review* of May 5.

For the purpose of making repairs and changes in the mills the Bessemer blooming mill and the rolling mill department of the National Tube Co.'s plant at Lorain, O., were closed Nov. 12. It is expected that the plant will resume in about four weeks.

The Labor Situation.

METAL TRADES ASSOCIATION NOTES.

CINCINNATI, Nov. 14.—The molders and coremakers employed by the Christopher & Simpson Architectural Iron & Foundry Co., St. Louis, struck on Nov. 7 because of the determination of that firm to adopt the piece work system. The vacancies in the shop have since been filled by the National Founders' Association.

A large delegation from St. Louis will attend the National Founders' Association convention to be held in Cincinnati on the 16th and 17th inst.

The monthly publication of the National Metal Trades Association, known as the *Bulletin*, will be discontinued on Jan. 1 and the *Open Shop* will be published in its stead. The November issue of the *Bulletin* will contain a very handsome halftone of the members of the Administrative Council of the N. M. T. A.

At the business meeting of the Chicago Metal Trades Association which was held at the Sherman House on Nov. 7 the chief topic of discussion was the question of membership in the National Metal Trades Association. A number of the members present signified their intention of making application and have since done so. The ballot now in preparation by Commissioner Eagan will be the largest sent out since his incumbency.

At a meeting of the Chicago Box Manufacturers' Association it was decided to start a labor bureau and Mr. Paul Blatchford, secretary of the Chicago Metal Trades Association, was placed in charge of same.

A number of first-class men have been added to the corps of machinists already on the pay roll of the N. M. T. A. These men are used as leading workmen in struck shops, as employment agents and in many other ways for the benefit of the members of the association.

Indications are that the revision of the by-laws of the National Metal Trades Association relative to the cost of initiation will result in bringing into its membership a large number of desirable employers, adding greatly to its numerical and financial strength.

LABOR NOTES.

The second annual convention of the Citizens' Industrial Association of America will be held in the hall of the Hotel Astor, 44th street and Broadway, New York, Nov. 29 and 30. Among those who will address the convention are: Daniel Davenport, of Bridgeport, Conn.; Charles N. Chadwick, of Brooklyn, N. Y.; Wallace Downey, of New York; P. D. Oviatt, of Rochester, N. Y.; Frederick W. Job, of Chicago; J. Kirby Jr., of Dayton, O.; C. W. Post, of Battle Creek, Mich.; J. C. Craig, of Denver; F. C. Nunemacher, of Louisville; Frederick Matson, of Indianapolis; and James A. Emery, of San Francisco.

The Tennessee Coal, Iron & Railroad Co., the Sloss-Sheffield Steel & Iron Co. and the Tutweiler Coal, Iron & Railway Co. have advanced the wages of the men at work in their mines on the open shop plan 2½ cents per ton, now paying 47½ cents per ton. The Republic Iron & Steel Co. had been paying the 47½-cent rate since its mines resumed operations on the open shop plan and the other companies now follow suit.

The recent unpleasantness between the Champion Iron Co., Kenton, O., and its molders has been settled and all the men have gone to work at the reduced wages. The foundry is running as usual.

The strike of iron workers employed on the four-track folding lift drawbridge being erected for the Consolidated railroad at Cos Cob, Conn., has been called off. Frank Buchanan, international president of the union, advised the men to return to work on the old basis.

The Republic Iron & Steel Co. has made a satisfactory agreement with the employes of its Bessemer department at Youngstown, O. The agreement is practically the same as has been in force this year with a few minor changes. It goes into effect on Jan. 1.

Railways in Argentine Republic.

In the current issue of the *Railway Age* Charles M. Pepper says that recent advices from the Argentine Republic indicate an unusual activity in railway enterprises. The congress at its present session is said to have granted 12,000 miles of new lines. While the bulk of material and rolling stock is bought in England, American contractors could, in the opinion of Mr. Pepper, find a much wider market in Argentina, if they cared to seek it. United States rolling stock was in great favor so long as orders for it were filled promptly. When they were delayed or ignored Europe got the benefit of this indifference. The Argentina government in its railway construction would like to buy in the United States, but recent contracts for rails, bridge material and rolling stock have been placed in Europe because the shops there were ready to meet the condition, while many of those of the United States were indifferent.

Increased Operations of A. M. Byers & Co.

A. M. Byers & Co., Pittsburg, pipe and tube manufacturers, have leased the pipe mill of the Carnegie Tube Co., Carnegie, Pa. Owing to the increased demand for pipe it was necessary to acquire this plant. In addition to operating mills on the South Side this company has skelp mills at Clearfield, Pa., under lease and operates a furnace at Girard, O. The Carnegie tube plant has been idle for fully a year and has been for sale. It will be placed in operation at once. The plant contains three heating furnaces and one 12-in. train of grooved rolls and has an annual capacity of 30,000 tons of skelp. Mills for the manufacture of wrought iron pipe from ¼ to 3 in., with an annual capacity of 20,000 tons, are also connected with the plant. It was first placed in operation in 1902.

Officials of the American Steel & Wire Co. last week inspected the Pittsburg and South Sharon works of that company, going later to the Cleveland and other plants of the company. The mills at Pittsburg and South Sharon are on in full and will continue to operate until shortly before the first of the year. Nine of the open-hearth furnaces at South Sharon are now in operation and blast furnace No. 2, which was recently blown in, on Saturday, Nov. 12, produced 427 tons, which is an excellent record for a new stack whose rated capacity is only 500 tons daily.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., this week commenced shipments of castings for the Pennsylvania tunnel on the contract awarded this concern by the O'Rourk Engineering Construction Co. In about three months shipments for the same kind of work will be commenced on a contract awarded by S. Pearson & Son of England. The company's plant was enlarged for this work, the main building having been extended to 500 feet in length and 110 feet in width.

During the four weeks ending Saturday, Nov. 5, the twelve 50-ton open-hearth furnaces of the Clairton plant of the Carnegie Steel Co., Clairton, Pa., produced 46,200 tons of steel. This is the best record ever made by a plant of this size, although the average output per furnace for a similar period has been exceeded. J. G. Laning is superintendent of this department, having come from Cleveland some time ago.

The Crescent plant of the American Sheet & Tin Plate Co., Cleveland, resumed operations Nov. 14, giving employment to 500 men. The plant had been idle for about a month.

FOREIGN IRON AND STEEL NOTES.

John Lysaght, Ltd., prominent manufacturers of galvanized iron and steel sheets, are about to build puddling furnaces at their Newport, Monmouthshire, plant, known as the Orb Iron Works. Announcements of puddling furnace construction in the United States have been exceedingly rare in the past few years. In June, 1904, there were 3,161 puddling furnaces in the United States as against 3,251 in November, 1901. The highest number ever reported was in 1884—5,265.

New steel works have been completed recently by Richard Thomas & Co., at Llanelly, South Wales, and a large output of ingots considerably larger in size than usually manufactured in Wales is now possible. These works are noteworthy for their extensive employment of electricity.

Bell Bros., Ltd., of Middlesbrough, Eng., are installing a large electric plant for supplying their own works, and also the Clarence Steel Works of Dorman, Long & Co., Ltd. The plant will consist of three high-speed direct-coupled engines and generators, a combined horizontal engine and dynamo to give 650 i. h. p., and a similar set of 600 i. h. p. The whole of the electrical machinery is wound for continuous current 240 volts.

A Manchester, Eng., market report of Nov. 4 has the following on the billet situation: "The general idea of the price for German billets is 83s. delivered Manchester, canal dues included, but we hear assertions to the effect that German billets have been sold as late as Tuesday at 80s. delivered, which is practically the price obtaining before the present upward movement began. In the German trade some irritation is caused by the stipulations of the syndicate with regard to extras, which are considered very irksome to dealers, and which may result in more attention being paid to American semi-manufactured steel. In some quarters, however, it is reported that the Americans, or at least the Steel Corporation, have withdrawn all offers of billets from this market; but some merchants maintain, on the other hand, that they can still buy American billets—whether from the Corporation or not remains uncertain—at 76s. 6d. c. i. f. Manchester, which is considerably under the ostensible German price."

The gross profits of the John Cockerill Co., of Seraing, Belgium, amounted to £165,520 in 1903-4, as against £212,600 in the preceding year. After making provision for depreciation, interest charges, etc., there remain net profits of £51,040, as compared with £51,064 in the previous twelve months. It is proposed to pay a dividend at the same rate as in 1902-3—namely, 12 percent.

A strike was recently precipitated at the Brightside Works, Sheffield, Eng., of Wm. Jessop & Sons by the refusal of the firm to discharge a non-union workman. All the union molders went out.

The shipbuilding employers on the northeast coast of England have issued notices for a reduction of 5 percent on piece rates, 1s. 6d. on wages over 30s. a week, 1s. on wages of 25s. to 30s. a week, and of 6d. on wages under 25s. This affects all classes employed in shipbuilding, and will take effect from Nov. 23.

At the 36th general meeting of the Society of German Iron Founders at Hamburg, a better demand for castings was reported to have appeared after Oct. 1 but selling prices had not responded. The meeting advised the several groups to take up the question of a general advance of 1 mark per 100 kilos (220 lb.). The proposal to form a syndicate including manufacturers of all classes of castings was considered too formidable for the present. A small organization on certain products, with gradual extension, was preferred. The report, in referring to the stove foundry branch, complained of the growing practice of the works making their stoves from models obtained from modelmakers, the result being that almost all the works supplied the same kind of patterns, and that individuality was lost. The desirability of the works returning to the old practice of making their own models was therefore urged.

The Scotch plate mills have had an agreement for some time. Recently Scottish and North of England plate makers have come together in a trade arrangement. This, together with the perfection of an arrangement between Continental and British rail manufacturers, has revived the proposal of the Midland and Welsh steel combine, which fell through some months ago owing to the subsidence of German competition.

The steel rail syndicate formed by British, German, Belgian and French manufacturers takes in all the rail manufacturers in Great Britain except a few whose output is very small or spasmodic. Allotments are made to the following British works: Cammell, Laird & Co., Ltd.; Guest, Keen & Nettlefolds, Ltd.; Bolckow, Vaughan & Co., Ltd.; the Barrow Hematite Iron & Steel Co., Ltd.; the Mossbay Iron & Steel Co., Ltd.; the Ebbw Vale Steel, Iron & Coal Co., Ltd.; the North-Eastern Steel Co., Ltd.; Steel, Peech & Tozer, Ltd.; and Walter Scott, Ltd. The make of rails in Scotland is insignificant at present.

A Middlesbrough, Eng., market report says that a slight improvement in iron and steel was noticed the first week in November. Pig iron shipments have been on a smaller scale and stocks have increased in warrant stores. However, the report adds that the opinion is gaining ground that the corner has been turned and this view is held by many who have had a long acquaintance with the iron industry. "It is satisfactory to learn that Bolckow, Vaughan & Co. have not found it necessary to stop the Eston Steel Works every other week as they anticipated. Last week they had intended to work only four days, but specifications were secured enough to keep the mills going, not only all the week, but they are assured of full work for the greater part of this month, and the measures that had been taken for the relief of the distress among their men have for the present been stopped."

In Germany negotiations for the formation of a wire, wire rod and wire nail syndicate have progressed favorably. Willingness to form such an organization has been expressed by all the producers, but the vast amount of detail involved makes it probable that the work cannot be completed by the end of the year.

G. R. Goldsack, president of the Leeds Association of Engineers, said at the opening of the winter series of meetings, that since 1900 the introduction of high speed steels had caused a revolution in engineering works and many new and stronger machines had in consequence to be installed. A great number of experiments had been carried out but he questioned whether the full benefits anticipated had been realized. He asked if it did not often happen that with high cutting speeds the depth of cut and feed was reduced. The true test of machine and tool was the weight of material removed in a given time. He doubted whether this was increased in all cases. In his visits to engineering works he found a large amount of work done in the old style.

The Wicksteed testing machine at the Conservatoire Nationale des Arts et Metiers, Paris, is of very unusual construction and capacity. It was the subject of a paper read before a recent meeting of the British Association at Cambridge by the designer, J. H. Wicksteed, president of the Institution of Mechanical Engineers. The builders, J. Buckton & Co., Well House Foundry, Leeds, have brought out an illustrated pamphlet discussing the machine with considerable detail. A full description of this testing machine was printed under the caption "A 300-ton Testing Machine" in *The Iron Trade Review* of Oct. 13.

Rowland Priest of Cradley Heath, Staffordshire, Eng., has designed an overhead runway without switches. The trolley is of the two wheel type with guide rollers. The trolley is switched to right or left at any junction of main with branch rails by twisting the load in the direction it is to travel. The short wheel base of the trolley allows curves of two feet radius to be easily handled.

Sir Lowthian Bell, whose absence from the trip of the Iron and Steel Institute to the United States was frequently noted and regretted, has undergone an operation for cataract.

TRADE PUBLICATIONS.

The work done by the machinery of the Ingersoll-Sergeant Drill Co., of New York, in driving the famous subway through Manhattan is told in a late booklet. The tale of subway progress is brief but the excellent illustrations are a story in themselves. The difficulty of the work undertaken by the contractors, the choice made in the selection of air driven equipment and the success attained, are made into a strong argument. The pamphlet is a daintily printed souvenir of the subway and its makers.

This Land of Ours is the burden of a 30-page booklet from the Carborundum Co., of Niagara Falls, N. Y. The title suggests the nature of the contents, which were evidently collected for distribution at the World's Fair. Starting with a brief account of the genesis of the Louisiana Purchase Exposition, then a few paragraphs describe the Capitol city, and afterwards New York, Chicago, San Francisco, the Yellowstone Park, Boston, New Orleans and Niagara Falls are treated tersely with the help of halftone illustrations. As a fitting sequel to the power plant description comes a discussion of carborundum and its manufacture. Ten years ago the plant had 120 h. p. and now uses 5,000 h. p. continuously, day and night. The price per pound has sunk steadily from $660 to about 10 cents on the way from experiment to manufacture. A number of illustrations show the factory progress of the product and its final form and purpose.

Commercial Alternator Design is a reprint of a paper presented by W. L. Waters at the latest convention of the American Institute of Electrical Engineers. The author is connected with the National Electric Co., of Milwaukee, and the pamphlet deals with the machinery of this firm in some detail but does not ignore the work accomplished by other designers. In this connection the author points out that S. Z. de Ferranti was the first to use copper strip, edge on, for field magnets. The development of the rotary field machine from the Brown design of 1892 to the present time has concise comment and several engravings help to an understanding of ventilation peculiarities. Mr. Waters shows the rigor of the guarantee adopted by his firm and the conflicting claims crowding upon the attention of a designer. The simplest course may not lead to the highest construction economy and too great ambition in the carving of expense can cut the final efficiencies of the running machine below the level of the guarantee. A trio of designs are stated and the cost and character of the results compared. The paper was discussed at the meeting and the opinions pro and con are noteworthy.

The "Skinner" lathe chuck is described in a circular from the W. M. Pattison Machinery Co., of Cleveland. The combination chuck has jaws moving universally by a rack and pinions and the jaws can be used independently by throwing the rack out of mesh, with a knurled nut. In the case of eccentrics or other irregular work the jaws may be placed in any requisite position and the rack and pinions meshed, forming a chuck with eccentric but simultaneously acting jaws. The chuck can be supplied with reversible jaws.

The engines made by the Scottdale Foundry & Machine Co. (Successors to Kenney & Co.), of Scottdale, Pa., are shown with much attention to detail in the new catalogue. The company manufactures Corliss engines, hoisting and haulage engines, coal tipple outfits and coke oven machinery. The Corliss type has been chosen for treatment in the catalogue under review and the machine illustrated is a substantial affair. The bed plate and main pillow block are cast solidly together. The bed is fastened to the cylinder by enlarging the end of the first and squaring it off to fit the latter with a generous-sized bearing. The bed has a continuous bearing on the foundation. The dashpots have spring connection to rods and the forgetful engineer caught with a long rod after indicating has no broken gear as a lifelong reminder of an oversight. The features of the engine are not easily dismissed in a few lines and a close reading of the catalogue is necessary for complete appreciation of an attractive machine. It is made compound condensing as well as in the simpler types with a wide range of sizes for selection.

The Browning Engineering Co., of Cleveland, builds cranes from 5 to 100 tons for all sorts of uses, and Bulletin No. 4 covers the locomotive type. This treats of Nos. 2 and 3 cranes, the first having a maximum capacity of 15 tons at 10 ft. radius and the No. 3 lifts 20 tons at a 10 ft. radius. They are designed to lift these loads at the specified radii, to travel along the track with load suspended or move several loaded cars, to make a complete revolution of the upper works upon the traveling base with load suspended and in either direction, to raise or lower the boom, and do these and other desirable operations separately or simultaneously at will of the operator. The speeds, capacities and other specification details are given with a number of illustrations.

A pocket catalogue and portion of the price list of pumps and hydraulic machinery comes from the Goulds Mfg. Co., of Seneca Falls, N. Y. This edition gives a few of the staple lines and is suggestive of the other publications of the company which include a general catalogue and special pamphlets of mine pumps, paper and pulp mill pumps, spray pumps and apparatus for spraying, vacuum and air pumps, ship and bilge pumps, and a variety of circulars describing other pumps. The pocket list has 120 pages with numerous engravings.

Automatic thread cutting is handled in a descriptive catalogue from the Automatic Machine Co., of Bridgeport, Conn. The automatic threading lathe has been illustrated in *The Iron Trade Review* and is now a familiar machine in many shops. It is built in a number of styles with belt or motor drives, taper attachment, back gears, etc. Among them is a special 12 in. x 4 ft. lathe. This is for fine tap and die work and relieves straight or taper taps. The spindle rotation does not reverse and the carriage is not returned by the lead screw. The builder has boldly cut loose from precedent in automatic machinery and has made the carriage spring back to the starting point by means of a weight, on the opening of the lead screw nut. The momentum is absorbed by an air cushion. This machine is heavy enough to properly thread and relieve any U. S. standard tap up to 3 in. diameter and any die up to 4 in.

The Binghamton Machine Tool Works, of Binghamton, N. Y., manufacture the Turner safety high and low water alarm columns. These are made in five sizes and are suitable for any working pressure. The inside parts of the device are attached to the cap and are removed with it. The steam and water pipes are connected direct to the body of the column. The column therefore need not be taken down or the fittings disturbed when an examination or repairs are under way. A number of testimonials, a price list and complete dimensions of the columns are contained in the circular.

The 16-in. crank shaper of the Queen City Machine Tool Co., of Cincinnati, has lately been redesigned and reinforced for extracting the full benefit from high speed tool steels. The machine is well illustrated and the salient features described in a recent circular. This shaper was shown in *The Iron Trade Review* of Sept. 1 and the points of excellence do not therefore require repetition at this time.

A miniature catalogue of the product of the A. S. Cameron Steam Pump Works, New York, is a reproduction in part of the complete catalogue recently brought out by the company. It is in handy form with admirable halftones and a neat cover bearing the characteristic acorn, the standard shape of the air chamber adopted by this firm and the registered trade mark. The Cameron pump can be completely taken apart without disconnecting the pipes. There is no dead center and the pumps are capable of an extremely slow motion. The steam mechanism has four pieces only and these of stout proportions. The cuts are accompanied with freely figured tables of dimensions and at a glance the sizes are seen of pipes, strokes, diameters, capacities, etc. The pumps comprise deep well machines, combination pump and boiler, feed, sinking, mining, light service and other pumps.

WORLD'S PRODUCTION OF IRON, STEEL AND COAL.

In the annual report of the American Iron and Steel Association, just issued, are given interesting tables showing the production of iron ore, coal, pig iron and steel in the world in 1903. In some cases the figures given are for 1902, this being the year of the latest official statistics for some countries. We reprint the tables below.

Tons of 2,240 pounds are used in giving the production of the United States, Great Britain, Canada, Cuba, India, Natal, South African Republic, New South Wales, New Zealand, Australasia, and "other countries," and metric tons of 2,204 pounds are used for all other countries, the latter being used as the equivalent of English tons in ascertaining the total production of all countries. The statistics are from official sources. The Belgian coal statistics do not include lignite.

Countries	Iron Ore			Coal and Lignite		
	Years	Product'n tons	Per-centage	Years	Product'n tons	Per-centage
United States	1903	35,019,308	34.71	1903	319 068,229	36.65
Great Britain	1903	13,715,645	13.59	1903	230,334,409	26.46
Germany and Lux	1903	21,230,630	21.04	1903	162,312,075	18.65
France	1902	5,003,782	4.96	1903	35,002,992	4.02
Belgium	1902	166,480	.16	1903	†23,870,820	2.74
*Austria-Hungary	1902	3,329,128	3.30	1902	39,904,313	4.58
Russia and Finland	1902	5,648,227	5.60	1902	15,508,924	1.78
Sweden	1903	3,677,841	3.65	1903	320,390	.04
Spain	1903	8,478,000	8.40	1903	2,798,113	.32
Italy	1902	240,705	.24	1902	413,810	.05
Canada	1902	390,717	.36	1903	7,139,852	.82
Cuba	1903	624,858	.62	.....	.....	.....
South African Republic	.....	.....	.....	1903	2,258,284	.26
Natal	.....	.....	.....	1903	713,548	.08
India	1902	85,235	.08	1903	7,480,589	.86
Greece	1902	546,409	.54	1902	8,546	.00
New South Wales	1902	13,555	.01	1903	6,354,846	.73
New Zealand	.....	.....	.....	1902	1,362,702	.16
Other Australasia	1902	116,994	.12	1902	976,442	.11
Japan	1901	70,172	.07	1901	8,945,938	1.03
Algeria	1902	525,012	.52	1902	285	.00
Other countries	1903	2,046,693	2.03	1903	5,782 833	.66
Total	...	100,900,000	100.00	....	870,498,000	100.00

*Includes Bosnia and Herzegovina. †Lignite not included.

The iron ore figures for "other countries" include 728,721 gross tons mined by Newfoundland in 1902.

The World's Production of Pig Iron and Steel.

In the following table is given the production of pig iron and steel in all countries in 1903, except in a few cases, when figures for 1902 are given. Tons of 2,240 pounds are used for the United States, Great Britain, Canada, and "other countries," and metric tons of 2,204 pounds for all other countries, metric tons being used as the equivalent of English tons in ascertaining the total production for all countries. The statistics of steel production for the United States, Great Britain, Germany and Luxemburg, France, Belgium, Austria-Hungary, Russia and Finland, Sweden, Spain, and Canada, embrace ingots and in some cases direct castings, but for Italy complete ingot statistics are not available and the statistics for finished steel have been used.

Countries	Pig Iron			Steel		
	Years	Product'n tons	Per-centage	Years	Product'n tons	Per-centage
United States	1903	18,009,252	38.80	1903	14,534,978	40.93
Great Britain	1903	8,811,204	18.98	1903	‡5,134,301	14.46
Germany and Luxem	1903	10,085,634	21.72	1903	8,801,515	24.79
France	1903	2,827,668	6.09	1903	1,905,000	5.36
Belgium	1903	1,216,500	2.62	1903	981,740	2.76
*Austria Hungary	1902	1,470,000	3.17	1902	1,190,000	3.35
Russia and Finland	1902	2,592,982	5.59	1902	2,118,971	5.97
Sweden	1903	506,825	1.09	1903	318,897	.90
Spain	1903	380,284	.82	1903	199,642	.56
Italy	1902	143,335	.09	1902	108,864	.31
Canada	1903	265,418	.57	1903	181,514	.51
Other countries (about)	1903	210,898	.45	1903	34,778	.10
Total	...	46,420,000	100.00	...	35,510 000	100.00

*Includes Bosnia and Herzegovina. † Does not include direct steel castings. ‡ Includes blast furnace castings.

Tables that have appeared in previous issues of the annual report of the association have given the world's probable total production of pig iron in 1800 as 825,000 English tons; in 1830 as 1,825,000 tons; in 1850 as 4,750,000 tons; in 1870 as 11,900,000 tons; in 1880 as 17,950,000 tons; in 1890 as 27,157,000 tons; in 1900 as 40,400,000 tons; and now the estimate for 1903 is 46,420,000 tons.

Exactly twenty-five years ago Mr. Swank estimated the world's production of steel in 1878 as amounting to 3,021,000 English tons. Subsequently he estimated the production in 1889 as amounting to 10,948,000 tons. The figures given in the above table show that the production had increased in 1903 to 35,510,000 tons.

Citizens' Industrial Association.

Arrangements are nearly completed for the second annual convention of the Citizens' Industrial Association of America, to be held at the New Astor hotel, Broadway and Fiftieth street, New York, Nov. 29 and 30. The list of speakers for the convention has not been completed, but as far as made up it includes the names of Daniel Davenport, of Bridgeport, Conn.; Charles N. Chadwick, of Brooklyn, N. Y.; Wallace Downey, of New York; P. D. Oviatt, of Rochester, N. Y.; Frederick W. Job, of Chicago; J. Kirby Jr., of Dayton; C. W. Post, of Battle Creek, Mich.; J. C. Craig, of Denver; F. C. Nunemacher, of Louisville; Frederick Matson, of Indianapolis; and James A. Emery, of San Francisco. It is the intention to give full opportunity for debate, and the program will undoubtedly be a very excellent one.

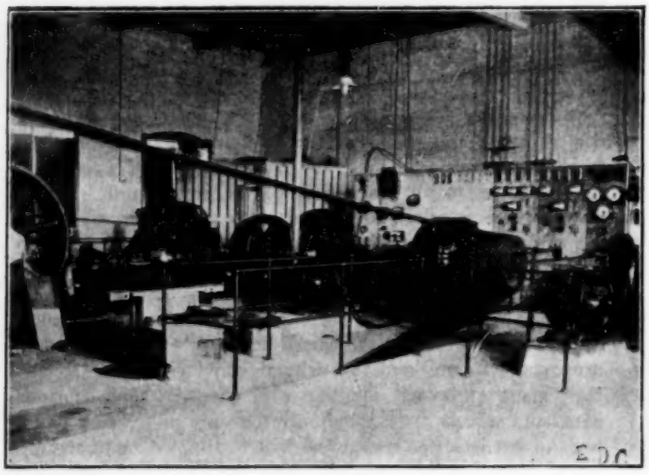
Catalogue A from the Oliver Machinery Co., of Grand Rapids, Mich., is a comprehensive volume of 213 6 x 9-in. pages with index and deals with the complete mechanical and mental equipment of the patternmaker. Everything is given place from books and magazines through a long line of woodworking machines to an assortment of the small stuff, such as dowels, letters, rules, dogs, sand cloth and paper, etc. Any acquaintance of Mr. Oliver knows that he has no doubt whatever of machine tool possibilities in woodworking and he has applied the theory and practice of the machine shop in the design of his product. The well rounded and massive frames, the solid appearance of the parts, the neatly curved and amply proportioned arms and the general convenience—all suggest the expert craftsman familiar with machine tool demands. The band wheels for example are not only of pleasing design but the fact has been recognized that steady and rapid running are at least equally essential. They are machined inside and out and the web between the spokes is milled to ensure smooth action at high speeds. The lathes, saw benches and other tools have interesting points of similar workmanlike character. The catalogue has many illustrations of fine quality.

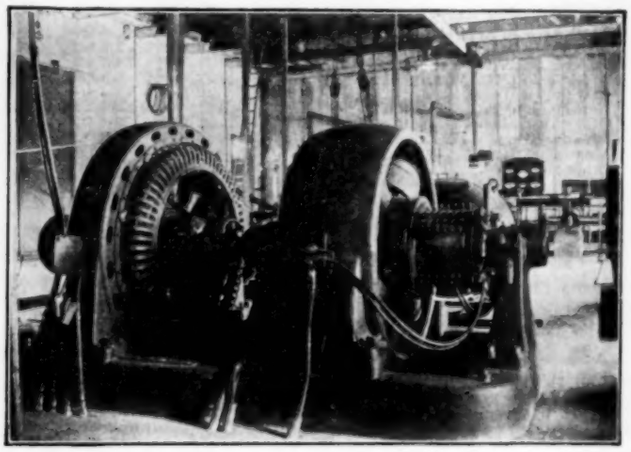
Catalogue No. 40 from F. E. Myers & Bro., of Ashland, O., is a voluminous work of 374 pages, the latest edition with illustrations and description of the entire factory product. The company manufactures an extensive line of agricultural accessories for the handling of hay and grain, fruit and water—pumps being a leading product. The goods manufactured are not all restricted to farming purposes, however, and we find store ladders, door and gate hangers, bicycle stands, pipe tongs and wrenches, dies, etc., in the list. The extensive enumeration lends strength to the claim that this is the largest works of its class.

The Joseph Dixon Crucible Co., of Jersey City, N. J., has another pamphlet on graphite lubricants. This contains the facts of importance concerning this make of lubricant and such description of lubricant character, consistency and special application as will enable the buyer to intelligently select suitable lubricants for his particular needs. Full details of the styles and sizes of the packages of graphite lubricant are included and the purchaser can therefore anticipate and recognize the right thing from the cover.

NOTEWORTHY ELECTRIC PLANT.

The Monterey County Gas & Electric Co., of Monterey, Cal., in its recent installation of electrical machinery represents the latest product of the National Electric Co., of Milwaukee. This plant constituted the exhibit of Kilbourne & Clark Co. at the eighth annual convention of the Pacific Coast Transmission Association, held in Monterey in June. The machinery includes a 200-k. w. generator and motor generator set, consisting of a synchronous revolving field motor of a capacity rating at 162 k. w., which drives by direct coupling a 550-volt direct current railway generator with a rating of 150 k. w. The 200-k. w. alternating current generator is of the belted type. It is of remarkably substantial construction, and follows very closely the structural design that has become well established in American types of revolving field generators. The erected weight is 12,850 lb. and its inherent regulation is well within 6 percent at unity power factor. It is run at a speed of 600 r. p m., and delivers a current at 60 cycles. The usual guarantee, namely that with an atmosphere temperature of 25 degrees C. the temperature of the machine will not rise above 35 degrees C. under a continuous 24-hour run at full normal load, was considerably better in that the actual rise under these load conditions was but 22 degrees C. In fact, it has been found to stand a remarkably heavy overload without serious heating, and in regular service has often been called upon to operate for considerable periods of time at an overload of over 50 percent.





VIEWS OF THE ELECTRICAL MACHINERY OF THE MONTEREY COUNTY GAS & ELECTRIC CO.

The efficiencies of the generator are as follows: 93 percent at 25 percent overload, 92.5 percent at full load, 91.25 percent at three-quarter load, and 88 percent at half load. The exciter runs at a speed of 1,450 r. p. m., is normally rated at 12 k. w., at 110 volts, and is belt driven from a pulley placed on the end of the generator shaft. It is remarkably cool in its operation, and there are no evidences of sparking or flashing at the commutator, even under conditions of extreme overload The motor generator set runs at a speed of 720 r. p. m. and the temperature of the synchronous motor does not exceed 25 degrees C. above the temperature of the surrounding air, and the direct current generator does not exceed a rise of 25 degrees C. in any part, when both machines are working under full load conditions.

An interesting feature in connection with the motor generator set rests in the fact that a 22-in. pulley with a 16-in. face has been placed on the shaft between the motor and generator, and that this pulley is belted to the flywheel of a 200-h. p. high-speed Buckeye engine. This gives absolute flexibility to the plant in that during the hours of light load both the units of the motor generator set may be run as generators and in that the motor generator set affords the link by means of which the railway load may be coupled in with the two-phase load, or vice versa. This enables a day alternating current service to be maintained in conjunction with the railway load, and, though the installation of the motor generator set may appear anomalous in view of the fact that the current for its operation is taken from generators located within the same premises, it is a successful solution of the problems presented by the local conditions.

Bessemer Road's Tonnage 4 1-4 Millions.

The shipments of ore over the Bessemer & Lake Erie railroad, which connects Conneaut, O., with Pittsburg, and brings ore from that port to the Carnegie plants, will exceed all records. According to present indications the total will reach 4,250,000 tons, which is 250,000 tons greater than the shipments last year. During the month of August 645,920 tons were brought down, which is the best record yet established. During September the shipments were 617,095 tons and in October 620,627 tons were hauled. The average for November to date is 25,000 tons and the indications are that this month will exceed all others.

It is reported in New York that Charles M. Schwab, who has a controlling interest in the reorganized United States Shipbuilding Co., has formulated a policy which provides for the sale of the Bath Iron Works, Bath, Me.; the Crescent Shipyard Co., Elizabethport, N. J.; the Canda Mfg. Co., the Hyde Windlass Co., Bath; and the S. L. Moore & Sons Co., Elizabethport. It is said to be Mr. Schwab's purpose to center his efforts on the Bethlehem Steel Co., South Bethlehem, Pa., and the Union Iron Works, of San Francisco. The report that he intended to obtain a controlling interest in the American Shipbuilding Co. is denied.

The Rochester & Pittsburg Coal & Iron Co. announces that J. G. Miller has been appointed general sales agent for the Adrian Furnace, with headquarters at Du Bois, Pa. Mr. Miller represented Rogers, Brown & Co. for over twelve years in their Buffalo and Philadelphia offices, and more recently in business independently under the firm name of J. G. Miller & Co., Land Title Building, Philadelphia.

The Cambria Foundry & Machine Co., Johnstown, Pa., has made an assignment to J. Earl Ogle. This step, which is said to have been taken by the agreement of practically all the persons concerned, will not interfere with the operations of the plant. The liabilities are said to be about $20,000.

Convention of the National Machine Tool Builders' Association.

(Special Telegram.)

NEW YORK, Nov. 16.—At the close of today's session it was announced that the convention had made no change in prices and had empowered the executive committee to call a meeting when any changes are found to be desirable. The convention is against any proposition for association ownership and management of a plant for the manufacture of large machine tools. It was also opposed to dealers giving larger orders, when machines are in good demand, with option of cancellation. The old officers were re-elected. They are as follows: Wm. Lodge, Cincinnati, president; W. P. Davis, Rochester, N. Y., first vice president; F. E. Reed, Worcester, Mass., second vice president; Enoch Earle, Worcester, Mass., treasurer; and P. E. Montanus, Springfield, O., secretary.

The next convention of the association will be held in Washington in the spring, the date of meeting to be decided by the executive committee later.

(Special Correspondence.)

NEW YORK, Nov. 15.—The third annual convention of the Machine Tool Builders' Association met this morning at the Hoffman house with an attendance of representatives from each of the firms in the organization. A list of the members was published in *The Iron Trade Review* of Nov. 3. The programme ahead of the convention is a noteworthy one and with adequate discussion will call for all available time at the sessions of today and tomorrow. The members were entertained at lunch today by the *American Machinist*, and tomorrow *Machinery* invites them to a ride in the subway, followed by lunch at 145th street. The session this morning took up the preliminary routine work, reports, etc., and immediately afterwards discussed the timely question: "Shall our members, as manufacturers, permit dealers to place large orders when machine tools are in good demand with a possibility of same, or a large part of same to be canceled if the market should drop, or other conditions arise over which the manufacturer has no control?"

The afternoon session took up the matter of unfinished business and then discussed the following subjects: "Shall our association recommend or adopt a uniform selling price for attaching, or preparing machine tools for receiving motors?" "Would a modification of the tariff, particularly as applied to some European countries and markets, be beneficial to our particular industry?" "Can our association become owners of and successfully manage an establishment for the building of large machine tools?"

Tomorrow the convention will elect officers, select a place for the next meeting and will deal with the following subject for discussion: "What shall be the attitude of our association on the reorganization of the discussed Machinery Dealers' Association, organized on the lines similar to the now existing Southern Association?" The meeting will next deal with: (a) Advancing prices, on an advancing market; and (b) Claims by dealers for commissions on sales made in neutral territory.

During the discussion on attaching motors to machine tools some interesting papers were submitted on standardization, etc. Mr. Geier's contribution to the subject was presented in his absence as he was unavoidably prevented from attending.

Standard Motors for Machine Tools.

BY FRED. A. GEIER.

The success of direct-connected motor-driven machine tools has been thoroughly demonstrated, and they are here to stay. Much of the uncertainty connected with the design of tools suitable for motor driving has been eliminated during the past twelve months by those manufacturers of electrical machinery who have given a great deal of attention to the subject of supplying suitable motors.

However, a satisfactory solution of the general problem has not been arrived at by any means, and in order to arrive at a satisfactory solution, it will be necessary for us machine tool manufacturers to first of all decide upon a standard speed range for variable speed motors—speed range that will cover the entire field of machine tool driving. This point settled, we can put the matter before the motor manufacturers, and should have no difficulty in getting them to bring out a line of such motors as standard for machine tools. There is considerable variation in the specifications issued by the several machine tool builders at the present time, because each of us has been struggling along as best he could and applying a motor that seemed to offer the least difficulties.

The fact that at the present time nearly all of the more important motor manufacturers are offering what they are pleased to call a machine tool motor with considerable speed variation through shunt field control, indicates at once the general trend of machine tool requirements. In order to arrive at different figures, let us analyze the case of the milling machine. From experience we find that we need a speed variation of 150 percent in the motor, that is, a maximum speed of 2½ times the minimum speed. This is more speed range than is required by some tools, but probably falls a little short of the range required by others. However, it would seem that a motor that would be suitable to milling machine driving would have plenty of range for any other machine tool. This will be clear from a further analysis of the problem: We require a speed range at the spindle of, let us say, from 25 or 30 to 1. By using a motor with a 2½ to 1 speed variation, and then applying double back gears to the machine, we get this speed range without any difficulty whatever. The method of speed variations of such motors through shunt field rheostats supplies plenty of speeds between the gear speeds. The Ward-Leonard Co. supplies these with anywhere from 35 to 120 steps or speeds on small motors. The back gear problem simplifies itself on those machines that require less speed range.

The Cincinnati Milling Machine Co. has standardized the electric drive arrangement for its milling machines, and is at the present time prepared to supply any size of miller with any one of half a dozen different makes of direct-current, variable-speed, shunt-wound motors with a 2½ to 1 variation in speed, and is thus in a position to meet the wishes of practically all its customers in regard to the selection of a motor.

But this does not completely end the trouble, because every one of the half dozen motors that can be used with this arrangement is entirely different in shape and size from any one of the others. It is therefore necessary to make up special parts to suit the particular motor specified on every order. This prevents the standardizing of all parts and carrying them in stock, and therefore increases the cost of the motor-driven machine considerably over what it would be if all makes of motors of given horsepowers had frames that were standard in certain important particulars. In order to manufacture motor drive parts for machine tools economically, by making them up in lots for stock, motor frames must be standardized in the following respects: Size and shape of the base; distance from the center of the driving pulley to the center of the base; height of the motor from the bottom of the base to the center of the armature shaft; and the diameter of the armature shaft.

For a standard speed variation we believe that 2½, or at the most 3, to 1 would be entirely satisfactory to meet the general problem, and these speeds should, of course, be kept as low as possible with a minimum speed somewhere below 700 r. p. m.

After a little thought it will be obvious that this standardization of motor frames will not involve great expense to the motor manufacturers, since with the single exception of the armature shaft, it is entirely a question of size and location of

the base of the motor with relation to the center of the pulley.

The advantage of such a standardization is at once apparent to all machine tool builders, as it would enable them to standardize their motor drive arrangements, carry all parts in stock, and therefore considerably reduce the present cost of motor-driven machines. It would also be of equal advantage to the manufacturers of electrical machinery, as it would enable each one of them to enter into competition on an even basis with all the others for supplying motors for driving tools. It will also enable them to go ahead at once and make up these motors in large quantities and carry them in stock especially for machine tool purposes and they could thereby reduce the cost of these considerably over the present method of making each motor to order. It is obvious that a combination of the reduced cost of motor and the reduced cost of the tool, as a result of standardization, will also materially reduce the now almost prohibitive selling price of motor-driven machine tools.

There is one other point—delivery.. At present prospective purchasers who have about decided to buy become very much discouraged and often drop the matter entirely, because of the fact that they must wait a long while for delivery, because both the tool builder and the motor manufacturer do not have parts in stock. All this will be eliminated by standardization.

Motors for machine tool drives must be standardized in the very near future, and the sooner this is done the better it will be for all concerned. If specifications can be decided upon now and the matter carried through, it will enable both the machine tool and motor manufacturers to carry parts in stock, make prompt deliveries, reduce their costs, and therefore lower their selling price to such an extent as to have an immediate direct influence and result in an increasing sale of electrically-driven tools.

Discussion.

During the discussion, Mr. McGuire said: The American Electric & Controller Co., which I have the honor to represent, has very closely investigated the matter of electric drive for machine tools, and has ascertained that you require a variation of speed on the motor of about 4 to 1, and that you must maintain the size of the motor within limited dimensions. We are successfully putting on the market today a controller for electric motors which can be operated from the apron of the tool, or from the top of the controller proper, and we secure a speed variation of 4 to 1 on any standard shunt-wound motor having a field range between 25 and 30 percent. While it shows enormous economy in operation, we will not go into details on this score, but invite anyone that may be interested to see a practical demonstration of the machine at our New York exhibit. One instance of what we are able to accomplish is that about one year ago in a modern belt-driven plant a mechanic on piecework faced 27 cylinder heads a day, with electric drive and rheostatic control he faced 38 cylinder heads per day and with our controller he did 67 cylinder heads per day.

W. H. Powell, of the Bullock Electric Mfg. Co., submitted a paper pointing out the influences of certain specifications on the size and weight of motors and the advantages of various voltage systems. The discussion was of a character not easily capable of condensation without probable violence to the intent of the speaker and therefore only his conclusions are given. The paper will be published in full at a later date in *The Iron Trade Review*. Mr. Powell said that "No matter what the design of motor or the method of speed control, the size and weight, and consequently the cost, are dependent on the slowest speed at which the motor is required to develop its full rated power. It is therefore desirable to keep the speed range down to a reasonable amount, which in our judgment is 3 to 1, with a minimum speed of 400 to 600, depending on output of motor."

Meeting of the National Founders' Association.

(Special Telegram.)

Cincinnati, O., Nov. 16.—The eighth annual convention of the National Founders' Association began its sessions at the Grand Hotel at 11 o'clock this morning. There were about 150 members in attendance and this number will be increased by later arrivals. The meeting is regarded as the most important in the association's history, in view of important proposals that will be considered bearing on the relations of association with the iron molders' union. All day Tuesday the administrative council of the association was in session putting in shape matters to be submitted to the convention. On Tuesday evening the dinner of the "Alumni" of the association was held at St. Nicholas Hotel, attended by 24 ex-officers, ex-members and present members of the administrative council. The after-dinner speeches bore on the New York agreement and there was general concurrence in the view that experience under it had been unsatisfactory and that it should be abrogated.

The association was welcomed to Cincinnati this morning by Vice Mayor H. L. Gordon, who was introduced by Henry Gosiger of the Eureka Foundry Co., Cincinnati. President I. W. Frank of the United Engineering & Foundry Co., Pittsburg, responded and then presented his annual report.

President's Report.

President Frank said that, judging from newspaper reports and from the soaring price of pig iron, a golden era is ahead of the foundry business, though it was not yet in evidence. The depression of the past year, while it had been serious, had brought some compensations in the opportunity it gave for the rectification of the abuses of the years of prosperity. Members found that they were getting far less than a full day's work in many cases. They were suffering from their own neglect and from the restrictions of the iron molders' union.

In attempting to eliminate the abuses of recent years they had run counter to the iron molders' union and strikes had resulted. Such members as had the courage to institute in their shops the free conditions that should prevail in every foundry in the United States had the backing of the association. Some of the most flagrant abuses were those which the molders' union were upholding under cover of the New York agreement. This matter had been thoroughly threshed out by the administrative council and that body was now unanimous in recommending the abrogation of that agreement, an announcement that was received with emphatic applause from the convention. Mr. Frank closed by appealing to the members to assert their just rights. Under present officers and the present mood of the iron molders' union, that agreement had proved impracticable and he urged the members to avail themselves of the present opportunity to relieve their shops of obnoxious conditions and receive the support of the association therein.

Secretary's Report.

The report of Secretary A. E. McClintock stated that an active campaign for new members had been prevented by the fact that the entire force of officers had been constantly employed looking after the wants of the membership, in view of numerous strikes during the past year. A total of 32 names had been added to the roll, leaving the present membership 456. Considering the business depression and the crisis through which the association had passed, it was thought it had maintained its fundamental strength wonderfully well. In the last quarter, there were reported for purposes of assessment a total of 18,649 employes in shops of members compared with 27,242 for the same period in 1903. Four meetings of the administrative council were held in the year, the most im-

portant of these being devoted to the completion of amendments to the constitution and to discussion of a uniform agreement. So thoroughly was work on constitutional changes done that for the first time in the association's history no amendments to the constitution and by-laws are to be acted upon by the convention. There are at present strikes in shops of 25 members of the association, involving 980 men. These strikes are in five Chicago brass foundries, three foundries in Utica, N. Y., three in Worcester, Mass., one in Holyoke, Mass, one in Franklin, Pa., one in Philadelphia, two in St. Louis and nine in Cincinnati, the last named involving 327 men. Over 200 non-union men have been brought into Cincinnati by the associatio. Violence has attended the Cincinnati strike, one non-union man being set upon and murdered, and a union molder has since confessed to the shooting, claiming it was in self defense. The certificates of recommendation issued by the association have been much in demand by non-union molders and coremakers in the past year.

Treasurer's Report.

The report of the treasurer of the State Savings Bank of Detroit was presented showing the strongest condition in the association's history, a large reserve fund having been accumulated. Commissioner O. P. Briggs was greeted with prolonged applause as he rose to read his report. He detailed the various conferences of the year with the Iron Molders' Union and the strikes that had resulted from the union's resistance of foundrymen's effort to secure fair conditions. The conference over a uniform agreement had been without result, the union representatives stubbornly resisting any change whatever, and employing the New York agreement to produce an absolute deadlock. After the reading of the commissioner's report the convention adjourned until afternoon.

Tonight the annual dinner of the association will be held at the Grand Hotel. It is expected that the convention will decide for the abrogation of the New York agreement and the extension of the open shop policy.

Tin Plate Advances Probable.

(Spcial Telegram).

PITTSBURG, Pa., Nov. 16.—American Sheet & Tin Plate Co., which started the Crescent tin mill at Cleveland, this week, containing six mills, will also start 16 out of 24 tin mills at Laughlin Works, Martin's Ferry, which have been idle for a long time. An advance in tin plate prices is considered quite probable. For the past week independents have refused to sell beyond December.

P. E. Slaymaker and E. C. Kauffman, receivers of the Susquehanna Iron & Steel Co., have filed their first account in the court of common pleas, Lancaster county, Pa. The report shows net earnings for 10½ months of $20,406. The production was: Pipe, 8,555 tons; bar iron, 15,237 tons; skelp, 7,983 tons, and muck bar (sold), 3,324 tons.

The Reading Iron Co., Reading, Pa., advises us that there is no foundation for the newspaper report that it intends building another new pipe mill in the near future.

The Interstate Commerce Commission, in an opinion announced Nov. 11, decided that freight rates which have been charged by terminals in and about the city of Chicago, controlled by the International Harvester Co. and the United States Steel Corporation, have been excessive for the service rendered.

The Sternberg Mfg. Co., manufacturer of cigar molds, announces the removal of its plant from Davenport, Ia., to Weil and Burleigh streets, Milwaukee.

LATE PITTSBURG NEWS.

Pittsburg, Pa., Nov. 16.—H. C. Frick Coke Co. fired all ovens at Dorothy plant yesterday morning.

The Chicago Railway Equipment Co. has filed suit in United States Circuit Court against the Standard Steel Car Co., asking injunction, alleging infringement on a patent car brake. The Underfeed Stoker Co. filed a suit in the same court against the Pittsburg Stoker Co., alleging infringement on a stoker patent.

It is reported that the Sharon Steel Hoop Co. will shortly contract for one eight and one nine-inch mill additional.

Answers have been filed by officers of the Carbon Steel Co. to the suit of John D. Slayback, asking for a receiver. All charges are absolutely denied. C. M. Raymond is president of the Carbon Steel Co., Pittsburg.

The advance made at the New York meeting is $1.50 straight on billets, sheet bars, forging billets, etc. No details are changed.

One sale, No. 2 foundry, has been made at $16.35 Pittsburg.

There was no transaction in or even offers of warrants at noon today, as fleeting supply of warrants has disappeared within a few days. An independent warrant yard will probably be established in Pittsburg, which it is expected will stimulate warrant trading.

Dealing in Pig Iron Warrants.

The trading in pig iron storage warrants was begun on the New York Produce Exchange Nov. 14. It excited much interest among the members, although the actual volume of trading was not large, the total transactions, in fact, amounting to only 1,000 tons.

The proceedings were opened by Mr. Truesdell, the chairman of the committee, who explained the trading rules and also the minimum differences, which latter must be a difference of 5c or multiples of that amount. There were two calls, the first at eleven o'clock in the forenoon and the second at two o'clock in the afternoon. The first sale, 200 tons November delivery at $16.20, was made by F. V. Dare & Bro. to C. C. Wheeler. The second transaction was a sale of 200 tons January at $16.25 by C. C. Wheeler to Cushing & Van Vleet; the latter then sold 100 tons April delivery to Thos. A. McIntyre & Co. at $16.55, and the final transaction of the day was a sale of 500 tons May at $16.30 by C. C. Wheeler to F. V. Dare & Bro.

In the annual report of Rear Admiral Manney, chief of the department of equipment, he recommends that the machine shop and foundry known as building 39, at the Boston Navy Yard, be extended and the old part fireproofed at a cost of $205,000. He also asks for a new wire rope factory to be erected at the yard at a cost of $110,000.

Alleging mismanagement, Albert H. Mellert, a stockholder, has applied for a receiver for the Reading Foundry Co., Reading, Pa.

As a result of the bi-monthly wage adjustment of the bar iron scale made at Youngstown, O., last week wages will remain unchanged during the months of November and December. The average selling price of bar iron was found to be 1.2c for the months of September and October. The puddlers will continue to receive $4.90 per ton.

The Berkshire Mfg. Co., of Cleveland, is putting a molding machine of unique type on the market. It works with either solid patterns, stripping or match plates. In using the latter, the operator places flask and bottom board in position, throws the lever, and the machine does the rest; fills the flask with sand, rams mold, vibrates pattern and lifts flask from pins. A complete description of this machine appeared in *The Iron Trade Review* of Sept. 29, and is discussed anew in a recent circular.

LAKE SUPERIOR IRON MINES.

The Oliver Iron Mining Co. has resumed work at the Puritan mine, west of Bessemer. About 50 men have been put to work. At the Amazon mine, in the same district, test-pitting is in progress. In the hole first put down, mixed ore was encountered. Pit No. 2, a short distance west, is now being sunk.

Superintendent Lutes of the Biwabik mine on the Mesabi range says that the mine will be through shipping ore about the 15th. The season's output will be about 700,000 tons.

The Pittsburg & Lake Angeline Iron Co. has taken a lease of the Rolling Mill property, Negaunee, Mich. Capt. Samuel Mitchell owns the fee and Joseph Sellwood, the lease. The property produces silicious ores, but it is hoped that better grades will be found. Work has been commenced with Thos. Walters Jr., in charge.

The Oliver Mining Co.'s Moore property on the Cascade range is said to be the only mine on the older ranges where steam shovel mining is in progress. About 1,000 tons are being loaded daily.

A. B. Willmott, who had charge of the Consolidated Lake Superior Co.'s mining department explorations under the old regime, has returned to his former place and active exploration may be expected. On the Canadian side indications are favorable.

John H. Van Dyke, one of the prominent pioneers of the Lake Superior region, recently celebrated his 81st birthday at his home in Milwaukee. The Menominee Mining Co. was organized by Mr. Van Dyke in 1875 and the Pewabic Mining Co. in 1885.

There is a scarcity of men in both the mines and the woods in the vicinity of Chisholm, Minn. About 100 men are needed in the mines.

The stock pile at the Vivian mine at Quinnesec, Mich., is all shipped. A force of 125 men is employed mining and shipping the output, which averages 8,000 tons daily. The full force will be kept during the winter, as it is the intention of the company to stock at least 60,000 tons before the shipping season opens in the spring.

The Mineral Mining Co., now exploring on the Breen property at Waucedah, Mich., has two drill holes down about 500 ft. each and is now working on the third hole.

F. A. Wildes Jr., who is engaged in looking after the state's interests in the northern part of Minnesota, believes that there will be increased activity in the mining industry this year. He states that while last year at this time there were millions of tons of iron ore in stock piles, there is now only one large stock pile on the entire range. Labor is in great demand and prospects for a good winter's work are excellent. More prospecting is being done. Clam shells are being more extensively used.

Shipments have ceased at the Moore mine, Cascade range, for the Oliver Iron Mining Co. This mine has been opened this year as an open pit, and is the first property on that range to be mined by steam shovel. The experiment has been very successful and the mine is now ready for a still larger production another season. About 125 cars a day of ore from this range, mostly from the Moore, are going to the Escanaba crushing plant. A single steam shovel at the Moore is loading some days as high as 50 cars of ore, the ore being blasted from a stope and loaded by the shovel as it lies at the foot of the stope in a partially crushed condition. The chunks of ore are of unequal size. So any such record is an excellent one. A little ore is going forward from the Platt mine and Volunteer shipments are about over. The latter mine will probably be idle next year, but at both the others indications are for a large business. The Cascade range will probably be still more active in 1905 than it has been in the past, for its ore is coming into more and more demand.

The Republic Iron & Steel Co. is shipping forward about 50,000 tons more than was expected a few weeks ago, and will close the season with ample ore at lower lake docks to keep its furnaces occupied during the winter. The product of Cambria and Lillie mines, Negaunee, will not exceed 100,000 tons for the year, and Lillie is scramming the last of its available ore, explorations with drills and otherwise having failed to discover a larger tonnage. Cambria is still a good mine. The company's Kinney mine of the Mesabi range has been idle all summer, as has its Wills. Neither of these mines has proved as good as was anticipated. Franklin, Bessemer and Victoria will probably be active all winter.

Stockpile shipments from Crystal Falls have been large of late and nearly all ore there is out of the way, leaving cleared decks for action this winter, much to the pleasure of miners and business men of the district. The last to go has been a large pile of high grade Bristol ore, that has been on hand for some time. A lot of Lincoln ore that has been on the surface for two or three years is now being cleaned out. Nothing is left at Great Western, which has been a drag on the district for some time. Mansfield is cleaned of ore, excepting for the 40,000-ton remainder of the 100,000-ton pile that was on surface last season. Armenia ore is all gone, and the mine will perhaps be unwatered soon.

Monroe mine of the Buffalo & Susquehanna Iron Co., at Iron Mountain, has been running heavily the past few weeks and is shipping till navigation closes. It is a lean ore running about 40 percent, but is desirable. The mine will be improved and extended the coming winter and it is expected that a better grade of ore will be found as depth is gained in the shaft and workings. Buffalo & Susquehanna people have not been especially active this year at most of their mines. Their large Susquehanna mine, in Minnesota, has been idle all year, and their Iroquois, also there, has done but little in the way of shipment. Both these mines, it is stated, will be busy the coming year.

Diamond drills have been put at work in the old Rolling Mill mine at Negaunee, which has been taken by the Pittsburg & Lake Angeline for the Jones & Laughlin Steel Co. There is an increased inquiry for drilling rigs on all ranges, and there is every reason to expect an activity far above that of the past 12 months. This is likely not only on the Mesabi range but on the Gogebic, Menominee and Marquette. Especially near Negaunee this latter district has shown a great increase of possibility in the past year or two and there are hopes that Negaunee will soon be a much more important mining town than even now. On the Gogebic there is increased activity all along the line, but especially west of Bessemer, near the old group that has been held for some years by Corrigan, McKinney & Co., and part of which they still control. On the Mesabi there will be some drilling, though that range is generally supposed to be pretty well punched with prospect holes. Most of the work here is likely to be in the way of thoroughly exploring and developing properties that have been found. In Baraboo, Wis., there will be a continuance of the drilling activity that has marked that district for two years and there may be some increase of interest in the new district west of Duluth on the line of the Northern Pacific road, in Aitkin and Crow Wing counties. This region, so far, however, is largely in the future, as very little of value has actually been shown there in spite of glowing reports.

Not a few steel makers who have been holding aloof from the ore mine market for some time are manifesting a desire to get prices on mines and to secure tonnage. This is probably in part due to the recent visits to the head of the lake of the American Institute of Mining Engineers, whose ideas as to relative importance of ore supplies of the various companies in the steel trade were very much changed and who found how strongly entrenched the pig people were and how little others seemed in comparison. Some steel men are already making inquiry for mines.

AUTOMOBILE FREIGHT TRUCK.

A freight truck of five tons capacity has been in use at the plant of the Illinois Steel Co. for about six weeks. The truck is of automobile type and was built by the Whiting Foundry Equipment Co., of Harvey, Ill.

The engine develops 35 h. p. at 950 r. p. m. and is very flexible, running from 125 to 1,000 r. p. m., by simple adjustment of the throttle. The crank shaft is large and has five bearings in the crank case. Connecting rods are bronze bushed at both ends and are amply strong. The valves are located in the cylinder heads and are interchangeable and easily removable. It should be noted that it is not necessary to grind in the valves if the compression should become low. This simply requires new seats, valves, etc., which can be applied in a few minutes. Patents are pending covering this feature. Jump spark ignition is used, but provision is made in each cylinder so that make and break can be employed if this is desired. The electric current is furnished from a 6-volt, 70-ampere hour, storage battery, and six large dry batteries are in reserve.

The cooling system is sufficient for the hottest weather, and the engine may be run at top speed for twenty-four hours without boiling the water or overheating parts. This is in marked contrast to many water cooled and all air cooled engines which have to be handled very carefully.

A McCanna sight feed lubricator is used. It has eight tubes and has a positive force feed to the cylinders and connecting rods.

The clutch, on which patents have been asked, has proven very successful. It has a metal to metal contact and requires little or no attention or adjustment. The transmission is of the standard sliding gear type, except that parts are made very strong and heavy. The gears are 4-pitch 2½-in. face and are case hardened. There are three speeds forward and a reverse and the truck runs from one to ten miles per hour. The transmission gears run in oil and all bearings are provided with large grease cups.

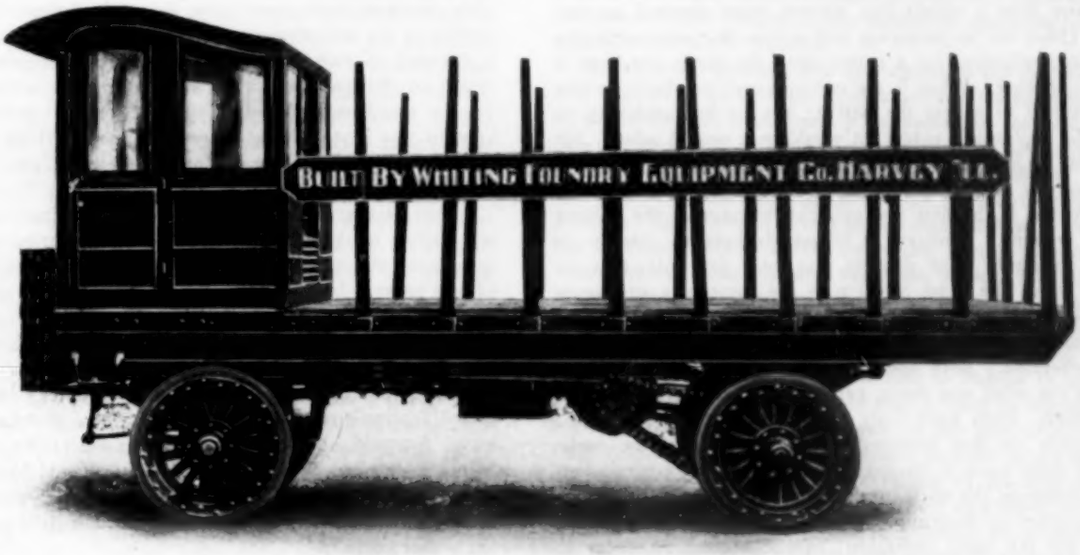
The differential is large and strong, is mounted on the countershaft and power is transmitted to each wheel by chains which are tested to 25,000 lb. each.

Thirty-six inch Archibald wood wheels with rubber tires are used, although steel or wood tires may be substituted at pleasure of purchasers.

The platform can be built to suit the special requirements of each customer.

Provision has been made for long, non-stop runs, as gasoline tank has a capacity of 40 gallons and lubricator holds about a gallon and a half.

The carburetor is designed for low grade gasoline at less than 10 cents per gallon, and as an average speed of nine miles per hour is easily maintained, 75 miles may be made in a 10-hour day and at an estimate cost of one cent per ton mile. Power can be furnished for handling a full load for 15 cents per hour.



AN AUTOMOBILE FREIGHT TRUCK.

New Coal Handling Machinery for Duluth.

The Wellman-Seaver-Morgan Co., Cleveland, was recently awarded a contract to construct two large coal handling machines for the Boston Coal Dock & Wharf Co., Duluth, Minn. This is one of the docks under the management of the St. Paul & Western Coal Co., of which M. J. Patton is superintendent. The machines consist of two conveyor bridges, each about 350 feet long, including front and rear cantilevers. The machines will be designed so that coal may be screened and loaded into box cars as well as unloaded from vessels, and will be built to be operated by steam. They will be equipped with 2-ton Hulett patent excavating buckets, and machinery designed to give maximum speeds of operation. The structural work will be of steel throughout, and the machines will be self propelling along the dock.

Rogers, Brown & Co.

Rogers, Brown & Co. have just announced the admission to the firm on Sept. 24, 1904, of E. L. Billingslea, J. K. Pollock and W. T. Shepard. The firm now consists of the following: Wm. A. Rogers, Buffalo; D. B. Meacham, Cincinnati; M. Cochrane Armour, Chicago; A. A. Fowler, New York; E. L. Billingslea, Chicago; J. K. Pollock, Cincinnati; W. T. Shepard, Buffalo. The new members of the firm have long been connected with it in responsible positions in their respective districts.

A card from the Gobeille Pattern Co., of Cleveland, has something to say about the pessimist who insinuates that patternmakers will soon go to wheat raising. The firm submits a record of recent order taking which in five days had five averaging $1,412 each and infers therefrom that the prudent purchaser of patterns will promptly fix up for the coming rush.

PATENT OFFICE INTERFERENCE.

BY JAMES HAMILTON, M. E.

An interference may be defined as a proceeding instituted for the purpose of determining the question of priority of invention between two or more parties claiming substantially the same invention. The interferants may both be applicants, or one may be an applicant and the other a patentee. But with the question of priority of invention between two patentees, the Patent Office has naught to do; that question is left to the determination of the courts. And why is the question of priority of invention an important one in our practice? The short answer is because our patent laws provide for the granting of a patent to only the original and first inventor (or inventors, if there are joint inventors). In this our statutes differ from those of Great Britain, Australia and some other British dependencies, where a patent is granted to the first introducer of a new and useful invention, be he inventor or not. So, in these countries a valid patent may be granted to a thief who has stolen the invention from abroad and communicated it to the British Patent Office with a request for a patent. The question of priority of *invention* does not here arise.

Suppose that a patent has already been granted by our Patent Office for an invention, and within two years after the grant an application for a patent upon the same invention is filed by another. What is the commissioner to do? He has no authority to cancel the patent; but he has authority to grant the applicant a patent (it would be a second patent) for the same invention, *provided* the applicant can satisfy the commissioner beyond a reasonable doubt that he, and not the patentee, is the first and original inventor of the subject matter in issue. Similarly, it frequently happens that, in an art advancing by slow degrees, (as most arts do), two inventors solve the same problem in the same way and apply for patents in such a way that their applications are pending at the same time before the office and claim substantially the same invention. Both applicants have worked in ignorance of what the other was doing, perhaps thousands of miles from each other. Both have truly invented the device in issue; but to only the *first* inventor can the grant asked be made. In both these cases it becomes necessary for the commissioner to determine the question of priority of invention. In the first, in order to determine whether he shall grant a second patent for the same invention; in the second, in order to determine to which of the applicants he shall grant a patent. To this end he declares an interference; in the first case, between the unexpired patent and the pending application; in the second case, between the two (or more) pending applications.

It will be noted that an interference is declared in only those cases in which the parties claim substantially the same invention. Patent specifications are made up of two essential parts; first, the description, in which the applicant sets out fully, clearly and exactly the manner of making and practicing his invention; and second, the claims, in which he particularly points out and defines what is new with him, what is his invention or discovery. In the description, he may state what is old so as to distinguish his invention from those of others; but in the claims, he must confine himself to a terse, technical and precise statement of what is new with him. Such words of limitation must be used in the claim as to exclude what is old; the subject-matter of the claim must be entirely new. In short, the claim should describe the invention. From this it follows that the issue of the interference is a claim; it defines the bone of contention between the parties. In the case of an interference between an applicant and a patentee, the issue is a claim of the patent. But in the case of an interference between two or more applicants, there is no such limitation; the issue may be a claim taken from one of the interfering applications, or may be a claim suggested to all the interferants, and original with none of them, but drawn up by the examiner. The latter practice comes under that rule of Patent Office procedure which makes it incumbent upon the examiner in case two or more applicants are trying to claim ("claiming at") the same invention, to draw up and suggest to the parties a claim which shall describe the common invention. The parties are given a certain time within which to insert by amendment the suggested claim; and in case the claim is not inserted, its subject-matter is regarded as disclaimed. But in case a claim of any of the interferants is regarded as precisely defining the subject-matter common to all the applications, that claim is suggested to the other interferants. Obviously, the claim which forms the issue of an interference must be one deemed allowable by the examiner.

The application or applications being in order, the formal declaration of interference is made, the issue of the interference is set out, and the parties notified of the names and addresses of their adversaries, and their attorneys. Each party is required to file within a certain time a "preliminary statement," which is sent under seal to the commissioner and is opened upon a day appointed for the preliminary hearing. This statement must contain the date (1) of the original conception of the invention defined by the issue; (2) upon which a drawing of said invention was made; (3) upon which a model of the invention was made; (4) upon which the invention was first disclosed to others; (5) upon which the invention was first reduced to practice; and (6) it must contain a statement showing the extent of use of the invention. The preliminary statement is under oath.

It may be that a mere reading of the preliminary statements will suffice to determine the question of priority, and judgment upon the record will then be entered without the taking of testimony. Such will be the case where the party fails to overcome the *prima facie* showing made by his adversary. The party who was the first to file his application in completed form is termed the senior party; the other is termed the junior party; and the respective filing dates of their completed applications constitute the *prima facie* showing made by each. Suppose, now, that upon reading the preliminary statements it develops that the several dates alleged by the junior party are all subsequent to the filing date of the senior party; in such a case judgment upon the record will be entered for the senior party.

The drawing up of the preliminary statement is a matter requiring the greatest care; for, a party is bound by the dates therein alleged, and even though he may by his testimony be able to establish dates prior to those by him alleged, he is nevertheless restricted to the dates set out in his preliminary statement. On the other hand, a preliminary statement is not to be used as proof of the dates alleged in favor of the party making it. But suppose a party discovers that he has made a mistake in the dates alleged and finds he can establish earlier dates. Is he to be allowed to amend his preliminary statement so as to get the benefit of such earlier dates? A rule which would allow ready amendment of the preliminary statement would manifestly be subject to great abuse, and would serve as an inducement to perjury. If the motion to amend is made prior to the opening of the preliminary statements, and so prior to the disclosure of the adversary's dates, the motion is generally granted. But after the preliminary hearing and the disclosure of the adversary's dates, the showing to support the motion must make it clear that the moving party was not at fault and that injustice would result to him from a denial of the motion. Rare indeed are the cases where the motion to amend is granted after the taking of testimony has been entered upon.

In the practice of our Patent Office, all applications for patent are kept secret, and no one except the applicant, his at-

torney and the officials of the office can have access thereto. But in the case of an interference, the applications involved are, after the preliminary hearing, thrown open for the inspection of the opposite party; and such inspection often induces one or both of the parties to move the dissolution of the interference. This motion is brought before the examiner of interferences, who is the court of first instance in interference proceedings. There are four recognized grounds upon which such a motion may be based, as follows: (1) That the issue is unpatentable; (2) That there is no interference in fact; (3) That the opposite party has no right to make the claim; and (4) That there has been such irregularity in the declaration of the interference as would preclude the proper determination of the question of priority. Motions to dissolve must be brought within twenty days from the preliminary hearing and are transmitted to the primary examiner for determination. The first ground is generally urged by a party who believes that the doubtful patentability of the issue and the weakness of his case renders it desirable to avoid the expense of the contest. In a case where an applicant is involved in interference with a patentee, an applicant will sometimes urge this ground; but his motion will be denied because the only effect of his motion is to throw a cloud upon the validity of the patent, and to raise a moot question—moot inasmuch as the real question to be decided by the commissioner is whether he is justified in granting a patent to the applicant for the invention of the issue, and if the applicant himself believes the issue unpatentable, that question is settled, or may be by the applicant's cancelling the controverted claim. The second ground is urged when it is believed that there is in fact no invention common to the two applications. The third ground is urged when it is thought that the adversary's disclosure cannot support the claim or issue. If the wording of the issue is vague or indefinite, an opportunity for moving under the fourth ground is presented.

These preliminary questions having been passed upon, times are set for the taking of testimony and for the hearing upon the record. Upon the junior party is the burden of proof. In case the senior party is a patentee, the junior party must prove his case beyond a reasonable doubt; but if he is only an applicant, the degree of proof required of the junior party in order that he may prevail is that of a fair preponderance of the evidence—that his contention is the more likely one to be right. Proof beyond a reasonable doubt is that required to establish guilt in a criminal case; while proof by a fair preponderance of the evidence is that required of the plaintiff in a civil suit. The testimony is taken generally before a notary public, who swears the witnesses and causes their depositions to be reduced to writing. The right to cross-examine is, of course, accorded the opposite party. The witnesses having all been examined, the testimony is printed and with the pleadings and the exhibits comprises the record upon which the case is to be decided. The matter to be determined by an interference proceeding is that of priority of invention; hence, testimony as to public use, non-patentability of the issue and the like is clearly irrelevant and may be stricken from the record. The hearing is before the examiner of interferences, from whose decision an appeal may be taken in order to the board of examiners-in-chief, the commissioner and the court of appeals of the district. With the procedure we shall no longer concern ourselves, but look at some of the principles which govern the question of priority.

Important among the dates in an interference are (1) the date upon which the invention was disclosed to others; (2) the date upon which a full size device embodying the invention was made and successfully operated, or as it is called in the law of patents, the date when the invention was reduced to practice; and (3) the date when the application was filed. The testimony of parties in interest must naturally be looked upon with some suspicion where it is favorable to themselves; and the unsupported testimony of such persons is given very little weight. Hence, testimony by an interferant that he conceived the invention on such a date, made drawings fully illustrating it at a later date, and a model embodying it upon another date avails him little when he produces no corroborating testimony. Moreover, proof by third parties' identifying the drawings or the model and testifying to a full explanation of the invention by the inventor in connection therewith is convincing and establishes a date of disclosure by evidence given by disinterested parties. In short, the date of disclosure is susceptible generally of proof by testimony entitled to a high degree of credibility; and moreover, proof of disclosure shows that the inventive thought had taken definite form at that time.

Proof of reduction to practice followed by continued use of the invention puts what the applicant has done beyond the region of experiment and shows that he has added to the store of knowledge. Just what constitutes reduction to practice cannot be definitely stated. We may say by way of exclusion that a drawing, no matter how full and elaborate, does not constitute reduction to practice; nor does a model, using that term in its ordinary sense. But filing an allowable application is deemed a constructive reduction to practice. Building a full size machine and putting it into successful operation is clearly a good reduction to practice.

He is the first inventor who first conceives the invention and first reduces it to practice. But cases not infrequently arise in which the first to conceive is the second to reduce to practice. How then? If the first to conceive has acted throughout with reasonable diligence, he is still regarded in law as the first inventor, although he is the second to reduce to practice. But where it is established that the first to conceive has not been diligent in the perfecting of the invention—as where, having made complete drawings, he does nothing more for several years during which his rival enters the field and reduces the invention to practice in ignorance of any work prior to his own—the second to conceive is regarded as the first inventor provided he is the first to reduce to practice. However, it must not be thought that a "race of diligence" is begun by the appearance of another in the field of invention. Only *reasonable* diligence—reasonable in view of all the circumstances—is exacted by this principle of the first to conceive; and though the second to conceive may have surpassed the first to conceive in diligence in reducing the invention to practice, yet the first to conceive and second to reduce to practice will be awarded priority of invention, if he has acted with reasonable diligence.

Suppose, however, that the first to conceive is also the first to reduce to practice—that he makes a full size device and tests it to the point of proving its perfectly successful operation; but that after such reduction to practice, he relegates the device to a store room and conceals the invention from the public. By such concealment the law holds that he has forfeited his rights to a patent in favor of one who, entering the field subsequent to the secret proof-tests, has given to the public the benefit of the knowledge of the invention, being himself in ignorance of what had been done by the other. So, where an inventor invented and constructed a full size clip for magazine rifles and, after testing it to his satisfaction, stored it away until he became aware of the grant of a patent to another for the same invention seven years later, the court held that he had by his concealment of the invention forfeited his rights of priority. The decision was based upon the broad ground of public policy, in that since the section of the constitution which provides for the granting of patents of invention sets out that the object of such grants shall be to promote the progress of the arts and sciences, it would be contrary to the intention thus expressed to grant a patent to one who so far from aiding such progress had deliberately concealed from the public knowledge of his invention until an-

other, though later inventor, had given to the public the benefit of such knowledge by applying for and obtaining a patent.

It not infrequently happens that interferants bear or have borne during the development of the invention the relation of employer and employee. Both now claim the invention. What are principles which shall control the determination of the question of first inventorship? It is well established that one who employs a mechanic to construct a machine embodying his invention may adopt as his own suggestions made by the mechanic and ancillary to the preconceived design of the employer; this is on the ground that an inventor is entitled to the benefit of the highest skill the art affords, in putting his invention into its best form. But where the work done by the employee embodies invention, as distinguished from mechanical skill, it cannot be successfully claimed by another except under an independent agreement. Where the employer simply points out the existence of a want without describing the means by which that want may be met, the employee who provides such means without further suggestion is the first inventor of such means, and entitled to a patent therefor. So, where one obtained a patent for a new paper from which to manufacture shirt collars, and it was shown that he did no more than to suggest to manufacturers that paper possessing the described qualities was desirable, the patent was held invalid on the ground that he was not the first inventor of the composition, not having communicated anything whatever in relation to the ingredients or mode of compounding them to the manufacturers he employed to engage in the effort to produce the article. A statement of the principles governing this line of cases is to be found in a recent decision of the District of Columbia Court of Appeals. It is as follows:

"Where a party claims an invention and also to have communicated that invention to another who has applied mechanical work thereto, and put such invention into practice, claiming the same as his own, the communication, in order to be effectual, must be shown to have been full and clear as to all the essential elements of the invention, and such as was sufficient in itself to enable the party to whom the disclosure was made to give the invention practical form and effect without invention on his part. In other words, his work in giving form and effect to the invention communicated, must be nothing more than the exercise of mechanical skill, as applied to the subject-matter. If the work embodies invention, as distinguished from mechanical skill, it cannot be successfully claimed by another, except where there has been an agreement that such completed invention, or the patent therefor, shall inure to him."

That the law governing interferences is justly administered by the several tribunals of the Patent Office is shown by the remarkably few reversals of their judgments by the Court of Appeals of the District of Columbia, which by its appellate jurisdiction exercises a supervisory authority over them. The several tribunals of the Patent Office are made up of men who are experts in this branch of the law, and experts, also, in all matters pertaining to patents. Still, it has been urged that interferences are a fruitful source of perjury and oppression under the skillful manipulation of "soulless" corporations. Knowledge of an invention having come to the officers of one of these corporations, it is asserted that they soon present to the Patent Office an interfering application signed by an accommodating "inventor;" and, in order that the expense of the proceeding may not be light upon the adversary, an "inventor" in a foreign country is chosen. By such tactics, interferences are made the tools of oppression and thievery. But the short answer to such contentions is that all judicial proceeding may be turned to similar purposes by the use of similar devices. As an example may be noted the oppression of small manufacturers by large corporations through infringement suits brought without just cause and forcing the defendant to a large expense, or to a loss of rights by the settlement extorted.—[The Sibley Journal.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The E. T. Lippert Saw Mfg. Co., Pittsburg, has been incorporated under the laws of Pennsylvania with $10,000 capital. The company's plant is located in Millvale. E. T. Lippert, E. B. W. and Frederick Pfischer are the incorporators.

The Steam Specialty & Mfg. Co., Pittsburg, has been incorporated with $5,000 capital to deal in steam specialties. The incorporators are: Samuel B. Forse, H. A. Pastre, P. J. Sullivan, W. B. Fitzpatrick and O. C. Pillichody.

A new company has been organized at Orlando, Fla., to manufacture boilers, etc. The capital stock is $25,000, and the incorporators are: J. W. Cain, J. H. O'Berry and J. M. Pedrick.

The Indianapolis Wire Box Co., Indianapolis, Ind., has been incorporated with a capital stock of $5,000. Directors are: Arthur R. Baxter, Edward T. Branham and John L. Clough.

The E. T. Lippert Saw Mfg. Co., Millvale, Pa., has been incorporated with a capital of $10,000. Directors are: Ernest T. Lippert, Edward B. W. Pfischer, Frederick Pfischer, Millvale.

The Accounting Machine Co., Chicago, Ill., has been incorporated with a capital of $2,500. Incorporators are: W. A. Bither, E. H. Stevenson and W. H. Card.

Among the projects now under consideration which will require partial or full equipment of machinery are the following: The Standard Roller-Bearing Co., of Philadelphia, which is constructing a new steel casting plant, has purchased a part of its equipment, but will probably need more. New equipment will soon be required for the Erie railroad for extensive improvements in the Jersey City yards, including several repair shops and a large roundhouse. The Oregon Railroad & Navigation Co., of Portland, Ore., will soon be in the market for machinery to be installed in the contemplated addition which will cause an expenditure of about $236,000. Specifications are also being prepared by the Canada Car Co., Ltd., for the equipment of its St. Henri plant, near Montreal. A large amount of machinery will be needed by the Kinnear-Hood Steel Co., Newark, N. J., which is planning to move its pressed steel radiator plant from Newark to more commodious quarters in New Britain, Conn.

The Manhattan Smokeless Furnace Co., New York, has been incorporated with a capital of $150,000. Directors are: W. H. Smith, R. M. Bickerstaff and R. C. Kraft.

E. S. Broadus & Co., Monticello, Ga., are in the market for lathes, drill presses, emery stands and general equipment for machine shop .

The Frontier Automatic Machine Co., has been incorporated with a capital of $10,000 at Buffalo, N. Y. Directors are: Frank B. Steele, Frank Kertz, Emil Neuhart, Charles F. Burkhart and Sylvus B. Nye.

Fires and Accidents:—

The plant of the Chicago Steel Co. at New Castle, Ind. was destroyed by fire Nov. 8. Loss, $75,000. One hundred men are idle.

Fire, believed to be of incendiary origin, in the plant of the Ansonia Copper & Sheet Iron Co., East Front street, Cincinnati, caused a loss of $10,000.

Fire which broke out in the foundry of the Brown-Corliss Engine Co., Corliss, Wis., Nov. 8, damaged the building to the extent of $20,000. It was erected about a year ago at a cost of $65,000, but the frame work was not damaged. The damage will be repaired at once.

Fire destroyed the plant of the Watson-Stillman Co., manufacturer of hydraulic machinery, Aldene, N. J., Nov. 7. Only

the iron frame work of the buildings are left standing. The loss is estimated at $65,000. There were 225 employes in the plant. The blaze started in the blacksmith shop from some unknown cause and rapidly spread to the rest of the works.

The machine shop of M. Liverman & Co., Economy, Pa., was destroyed by fire Nov. 10. The loss is estimated at $15,000.

New Construction:—

The remodeling of the Chattanooga furnace of the Lacey-Buck Iron Co., Chattanooga, Tenn., has been begun. The plans for the reconstruction have been drawn by J. L. Dowling, who planned the new furnace at Battelle, Ala.

The Des Moines Bridge & Iron Co., Des Moines, Ia., has commenced work on an improvement that will double the capacity of the plant and call for a very considerable investment in buildings and machinery. The company recently purchased ten acres adjacent to its present plant and the work now under way contemplates the occupancy of this ground.

The Delphos Foundry Co., Delphos, O., has nearly completed its new plant, which will be in operation in December. It will employ 50 men.

Improvements are to be made at the Ensley steel plant, belonging to the Tennessee Coal, Iron & Railroad Co., so that the production will be increased to about 20,000 tons of steel per month. The production in October was over 15,000 tons, the greater portion of which went into steel rails.

The Red Jacket Pump Co., Davenport, Ia., has let the contracts for the construction of its new plant, which will cost $35,000, and will include a foundry 100 x 200 ft., machine shop 80 x 200 ft., and several smaller buildings.

Citizens of Renovo, Pa., are celebrating the announcement that the Pennsylvania railroad will erect shops there double the capacity of the present shops.

The Peerless Motor Car Co., Cleveland, O., has let the contract for its new foundry, which will be constructed by the Van Dorn Iron Works Co., Cleveland. It will be 110 ft. long and 50 ft. wide.

When the shops which the Santa Fe road is rebuilding at La Junta, Col., have been completed they will be the finest on the Santa Fe system outside of Topeka and will employ about 1,200 men. The cost will be $286,000. The improvements which are to be made consist of eight additional stalls to the round house, making 31 stalls in all; a new power house, lavatory building and blacksmith shop, 82 x 140 ft.; a bar iron storage house, coal and coke storage house, master mechanic's office and platform, oil house, machine, boiler and tender shops, transfer table pit, additional tracks, gradings and sewerage system. The machinery has been installed in the machine shop at a cost of $88,000. The shops will be completed about the first of the year.

The Davenport Locomotive Works, Davenport, Ia., will increase the capital stock to $200,000. The company takes this step preparatory to increasing its capacity. The plant is now turning out two complete locomotives each week and the prospects for a successful season are very good.

Workmen are now engaged in placing the finishing touches on the new annealing room of the Malleable Iron Works, Marion, Ind. The annealing room is 60 percent larger than the former department and is equipped with new and improved machinery.

The American Shipbuilding Co. has purchased 22 acres at Lorain, O., south of its present plant, and will build a large addition which will double the capacity of the plant. The Bay View, Wis., plant will also be improved, but not on such an extensive scale.

The Chrome Steel Works, Chrome, N. J., are having a new tire rolling mill built at the Bethlehem Steel Works, and will shortly install it.

The John Illingworth Steel Co., with offices at 25 Cliff street, New York, recently incorporated, has purchased the Frankford Steel Works, Frankford, Philadelphia, which the new company will operate, manufacturing crucible steel. The new company intends to enlarge the plant and make it thoroughly up to date in every respect.

The Froggatt Scale Co., Chicago, has been incorporated to build railroad track scales, hopper scales and all sizes and kinds of wagon, portable and dormant scales. The present plant of the company will be used for a time, but it is expected that large additions will be made during the coming year.

The Heider Mfg. Co., Carroll, Ia., manufacturer of plow and harvester eveners and other agricultural specialties, is erecting a new two-story building, 50 x 100 ft.

The Buffalo Elevator Supply Co., Buffalo, N. Y., is equipping an up-to-date machine shop for general machine work, power transmission and elevator repairs and for the manufacture of elevators.

The United States Foundry & Sales Co., South Norwalk, Conn., has completed the addition to its foundry and core room and has also established a pattern making department.

Cobb & Drew, Plymouth, Mass., and Rock Falls, Ill., manufacturers of rivets, tacks and nails, have completed a new plant at Rock Falls, Ill.

The D. A. Tompkins Co., Charlotte, N. C., has begun the erection of a two-story building 75 x 150 ft., which will be equipped as a machine shop.

The Wheland Machine Works, Chattanooga, Tenn., have just completed extensive additions to the plant, which now covers 16 acres. The improvements consist of a foundry 110 x 210, blacksmith shop 45 x 105 ft., an annex to the machine shop 30 x 45 ft. and a complete power plant. The foundry building is a brick and steel structure, absolutely fireproof. In this building are three electric traveling cranes—one large and two small. The blacksmith shop has been equipped with an 800-pound steam hammer and other requirements to make it up to date.

Capitalists of Columbus, O., will hold a meeting in a few days to consider the organization of a company for the erection of a 300-ton blast furnace. R. S. Warner, 640 East Broad street, is one of those actively interested in the project.

The Spring Steel Wire Fence Co., Anderson, Ind., will enlarge its plant by an addition 55 x 112 ft., which will bring the capacity of the plant up to more than 10,000 yards of fence per day.

General Industrial Notes:—

The Binghamton Boiler Compound Co., Binghamton, N. Y., recently incorporated with a capital of $60,000, has been making boiler compound, both liquid and powder, for a number of months. The company has leased a commodious building for a term of years, and, with a thorough knowledge of the business and ample cash capital, expects to do a large and increasing trade.

J. W. Duntley, president of the Chicago Pneumatic Tool Co., has gone on a four weeks' business trip to Europe, the object being to open the company's new plant in Scotland. Mr. Duntley announced before leaving that the company had made a contract to supply pneumatic tools to the largest shipbuilding yard on the Clyde and a three years' contract with the German Government to supply its shipyards with tools.

J. H. Schurtz, president and general manager of the National Valve Works, Sandusky, O., has sold his interest to J. F. Williams, of that city, who takes charge of the plant. The company expects to have additional capital and enlarge the business.

The Reo Car Co., recently organized at Lansing, Mich., expects to turn out 3,000 cars during the coming year. Orders for material have been based on this estimate. The roof of the first of the large buildings that are to be erected by the company was completed this week.

The Herron-Brady Pump & Foundry Co., Chattanooga,

Tenn., has been awarded the contract by the Panama Canal Commission for furnishing hydrants and valves in constructing the Panama canal.

The Citico Furnace Co., Chattanooga, Tenn., has just closed a deal with the North Alabama Mineral Co. for 120,000 tons of red iron ore to be delivered within the next two years. Extensive improvements have been made at the Citico furnace.

C. N. Sherman has purchased of A. H. LeFebvre, a two-thirds interest in the Harmon Machine Co., Watertown, N. Y., and has been elected secretary and treasurer of the company. The other officers and stockholders remain as formerly. Mr. Sherman, in addition to his former majority holdings of stock in the Brownville Iron Works, has bought the interests of D. B. Gotham, thus becoming sole owner. The two shops will be run separately, though the Harmon Machine Co. has purchased the screen business of the Brownville Iron Works, together with all patterns, patents, drawings, records, etc. The Brownville plant will be run as a job repair and brass foundry. By still another deal Mr. Sherman has purchased from J. A. Outterson enough stock of the Carthage Machine shop, Carthage, N. Y., to give him a three-fourths interest and it is expected that the Carthage shop will be consolidated with the Harmon plant. This, however, will not be done for several years.

The report which has just been issued by the Binghamton plant of the American Car & Foundry Co., located in the suburbs of Memphis, Tenn., shows there were 80 more cars built during October than were ever built by the same plant in a similar length of time. October was the first month the plant had been operated by this company, which recently purchased the property from the Southern Car & Foundry Co. There were 240 cars turned out, and the value was approximately $100,000. The company is employing 450 men and is steadily adding to the number.

Because of inability to secure sufficient natural gas, the plant of the Republic Iron & Steel Co. at Muncie, Ind., employing 1,000 men when running at full capacity, has been compelled to shut down in nearly all departments while the change in fuel from gas to coal is being made.

The Westinghouse Electric & Mfg. Co., Pittsburg, has been awarded the contract for equipping the Long Island division of the Pennsylvania railroad with electricity. The contract calls for the motor equipment of 122 cars with motors of 125 h. p. capacity.

The Reliance Tube Co., Pittsburg, will shortly place its boiler tube plant at Brackenridge, near Pittsburg, in operation. Tubes from two to six inches will be rolled. Charles Bailey is chairman; James A. Kelly, secretary; and Charles C. Henderson, treasurer.

The Duncansville, Pa., plant of the Carnegie Steel Co., one of the plants absorbed by the American Steel Hoop Co., is being dismantled. Owing to its location economical operation was impossible.

The Northern Engineering Works, crane builders, Detroit, Mich., report recent shipments of cranes as follows: Bethlehem Foundry & Machine Co., 4-ton electric crane, 43-ft. span; Public Service Corporation of New Jersey, 10-ton 39-ft. span; New York Butchers' Dressed Meat Co., 12-ton 39-ft. span; Union Metallic Cartridge Co., 12-ton 30-ft. span; People's Power Co., Rock Island, 10-ton 50-ft. span; Duluth Street Ry. Co., 20-ton electric crane, special. The company reports a much better outlook for business. This company is also putting on the market some electric trolley hoists, circulars of which will be sent on request.

The Garry Iron & Steel Co., Cleveland, reports that it is receiving an unusually large number of orders and inquiries, for this season of the year, in its roofing, paint and pipe departments. The demand for its genuine charcoal iron roll roofing, conductor pipe, and eaves trough is increasing, and the sales of its various brands of tin and terne plates are exceptionally heavy. This company has recently closed a large contract for furnishing and applying its Trinidad pitch lake asphalt roofing, for the Lee Paper Co., of Vicksburg, Mich., for its new plant, requiring about 1,000 squares. It is now working on several good structural steel contracts, including a boiler and engine house for the Horse Shoe Forestry Co., of Horse Shoe, N. Y., a large glass plant for the Baldwin-Travis Co., at Kane, Pa., structural steel work and roofing for the Ohio Retarder Co., at Port Clinton, and a number of steel buildings for the Scranton Coal Co., of Scranton, Pa. It has also received a number of good orders from railroads and manufacturing plants for its pneumatic, electric, and hand power cranes, and is looking for an exceptionally good business in all its lines, during the early part of 1905.

Additional orders have been placed in connection with the East river section of the Pennsylvania railroad's tunnel. The largest of these was that awarded by the Ingersoll-Sergeant Drill Co. to the Buffalo Forge Co., of Buffalo, N. Y., for four large forced draft fans with engines directly connected, four 10-inch and two 8-inch centrifugal turbine pumps with directly connected double vertical engines and 10 steam pumps of large size. These machines will be installed by the Ingersoll-Sergeant Co. in two temporary power houses and will be used by that company in completing the contract which it secured for supplying the necessary air compressors.

The contract has just been closed by the Atlantic Equipment Co. for 12 locomotives of the Mogul type for prompt shipment to Japan. The order comes from the Kinshiu Railway Co., which is adding materially to its rolling stock for both passenger and freight traffic.

The Alliance Machine Co., Alliance, O., has just shipped two large gantry cranes, which are to be used by the Pennsylvania Steel Co. in erecting the new bridge at Blackwell's Island, N. Y. Each trolley has a combined hoist of 110 tons and each crane weighs 282,000 pounds. It required 12 cars to convey this shipment to its destination. The Pennsylvania Steel Co. has just installed at its plant at Steelton, Pa., two 50-ton and one 15-ton four-motor cranes, one 25-ton gantry crane of 85 ft. span and six 10-ton wall cranes, all built by the Alliance Machine Co.

Hogan & Son, steel manufacturers, Brooklyn, N. Y., have purchased a plant on Fifty-third street, between First and Second avenues, Brooklyn, into which they will move and begin business at once. The plot is 140 x 100 ft., on which now stands two large three-story brick factory buildings, formerly occupied by the A. B. Diss Co., manufacturer of chair castors.

The Virginia Iron & Bridge Co., Roanoke, Va., which recently purchased the plant and business of the Carolina Steel Bridge & Construction Co., has increased its capital stock to $500,000. It will have an annual capacity of 20,000 tons of manufactured material, and will continue to contract for the construction of bridges and other structural work. E. Edwin Michael will remain president.

The Battle Creek Iron Works Co., and the Coburn Machine Co., both of Battle Creek, Mich., have consolidated their interests and will be known in the future as the King Gas & Gasoline Engine Co. The capital stock is $100,000, surplus $25,000, all paid in. The company will manufacture gas engines of all kinds and fire department engines for cities and corporations. New offices will be selected and in the meantime Sylvester Greusel, secretary of the Battle Creek Iron Works, will look after the interests of the new company and settle the affairs of the old ones. Mr. King, patentee of the engine, will be expert designer and salesman. The plant of the Battle Creek Iron Works will be used.

Both the Hall and Atlantic stacks of the Republic Iron & Steel Co., located at Sharon and New Castle, Pa., respectively, are now in operation. This company has its four Northern stacks in operation for the first time in six months, and the iron produced is still insufficient to meet the heavy demands of the steel plant.

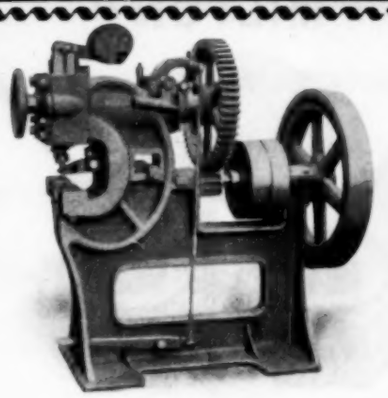
COCHRANE SEPARATORS—You ought to have them.

Separating water from steam or oil from steam is dependent upon precisely the same principle, i. e., that of removing liquids from gaseous or vaporous currents, but while you might get along with a separator that takes out only half of the water you would soon get into trouble with this 50 per cent efficiency separator in oil service, for you must have the most efficient separator for oil service, and the separator that is adapted for oil service is the separator that will give you the best results in live steam service, the construction being adapted for the higher pressures. The Cochrane Oil Separators gave such exceedingly efficient and satisfactory results in taking out oil that we knew they would make good steam separators, and they have. The Cochrane Separators will take care of a flush of water; the opportunity is given for the water to flow right straight into the well; any water (or oil) shot along by the steam over the main opening to the well is intercepted by the baffle; the ribs on the baffle prevent side travel; the ports are on the side and properly placed; the steam passages are of the right size; altogether the separator represents the minimum loss from friction. Liberal storage space is provided for, and the water that is taken out is prevented from being picked up again by the current of steam. As to workmanship, materials and fittings, they are the best.

If you would like to know more about these Cochrane Separators send for our catalogue 11-S. Yours for the asking.

HARRISON SAFETY BOILER WORKS, Clearfield and 17th Sts., Philadelphia, Pa.

Manufacturers of Cochrane Feed Water Heaters, Cochrane Steam and Oil Separators and the Sorge-Cochrane Systems.



6" throat only
Capacity, ½" hole through ½" plate

"Cleveland" Solid Frame Punches

STYLE **B-A**

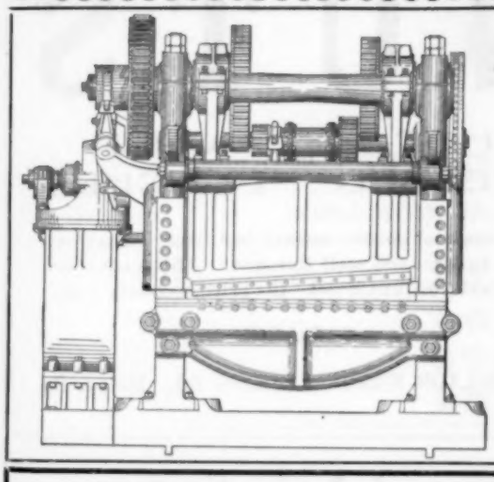
In stock for immediate delivery

Machines Equipt with the Latest Improvements

The Cleveland Punch & Shear Wks Co.

CLEVELAND, OHIO

"Our Name Denotes Quality"



MACKINTOSH, HEMPHILL & CO.

FORT PITT FOUNDRY.

Twelfth and Etna Streets, Pittsburg, Pa.

MANUFACTURERS OF

ROLLING MILLS, Hydraulic or Geared Shears, Presses, Punches, Riveters,

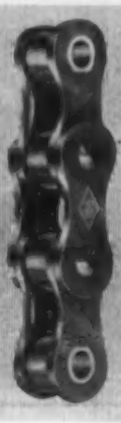
BLOWING REVERSING & CORLISS **ENGINES**

IRON, STEEL AND BRASS CASTINGS

MISCELLANEOUS

IRON AND STEEL WORKS MACHINERY

DIAMOND CHAINS



A thoroughly well made steel chain, running on properly milled sprockets, will last much longer and prove much more efficient than a short belt. The truth of this statement is well demonstrated wherever feed belts have been replaced by chains

We solicit correspondence concerning the manufacture of chains for special purposes

FEDERAL MANUFACTURING CO., Indianapolis

AMERICAN IRON & STEEL MFG. CO.

General Offices at LEBANON, PA., U. S. A.

MANUFACTURERS OF

Merchant Bar Iron and Steel

(ANNUAL CAPACITY ABOUT 150,000 TONS)

ALSO EVERY VARIETY OF

Machine Bolts, Nuts, Washers, Turnbuckles, Lag Screws, Railway and Dock Spikes, Harvey Grip and other Railway Track Bolts. Boilers, Ship and Structural Rivets. Car Forgings and Rods and Irons for Bridges, Buildings, Etc., Etc.

This Company owns and operates the works formerly owned by J. H. STERNBERGH & SON, Reading, Pa. NATIONAL BOLT, NUT AND RIVET WORKS, Reading, Pa LEBANON IRON CO., Lebanon, Pa. EAST LEBANON IRON CO., Lebanon, Pa. PENNSYLVANIA BOLT AND NUT CO., Lebanon, Pa.

WE BUILD

MACHINERY

FOR

WIRE DRAWING AND CHAIN MAKING

that's unequaled for rapid production of high grade work. Nearly 50 years' experience is at your service. We can save you money. Let us know your needs. We want your order, be it large or small.

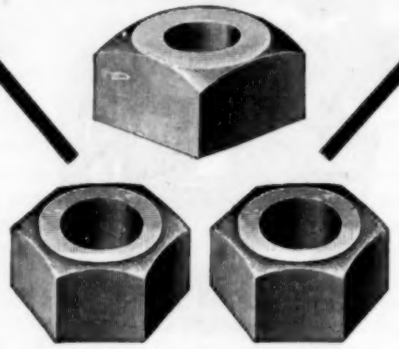
Write for prices, stating capacity wanted

THE
TURNER, VAUGHN & TAYLOR COMPANY

CUYAHOGA FALLS, O., U. S. A.

1856 1904

"MILTON"



NUTS

HOT PRESSED or COLD PUNCHED

Are made of double refined bar iron. They're true to size, and well finished. This ought to interest you, but if not—the price certainly will.

CATALOG?

THE MILTON MANUFACTURING CO., Milton, Pa.

Superior Charcoal Iron Company,

Grand Rapids, Michigan,

Manufacturers of Car Wheel, Malleable, Special Cylinder and Strong Foundry Irons.

The well-known brands of Lake Superior Charcoal Pig Iron—

PIONEER, CHAMPION, ELK RAPIDS, ANTRIM, EXCELSIOR, PENINSULAR, MARQUETTE, MICHIGAN and CRESCENT.